MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 12 JUNE, 1939 Number 1

Published monthly by
Gardner Publications, Inc.
431 Main St.,
Cincinnati, Ohio

DON G. GARDNER
President and
General Manager

JOHN M. KRINGS
Advertising Manager

G. M. FILLMORE
342 Madison Ave.,
New York
Murray Hill 6-3899

GEORGE H. MEYERS
Tribune Tower, Chicago
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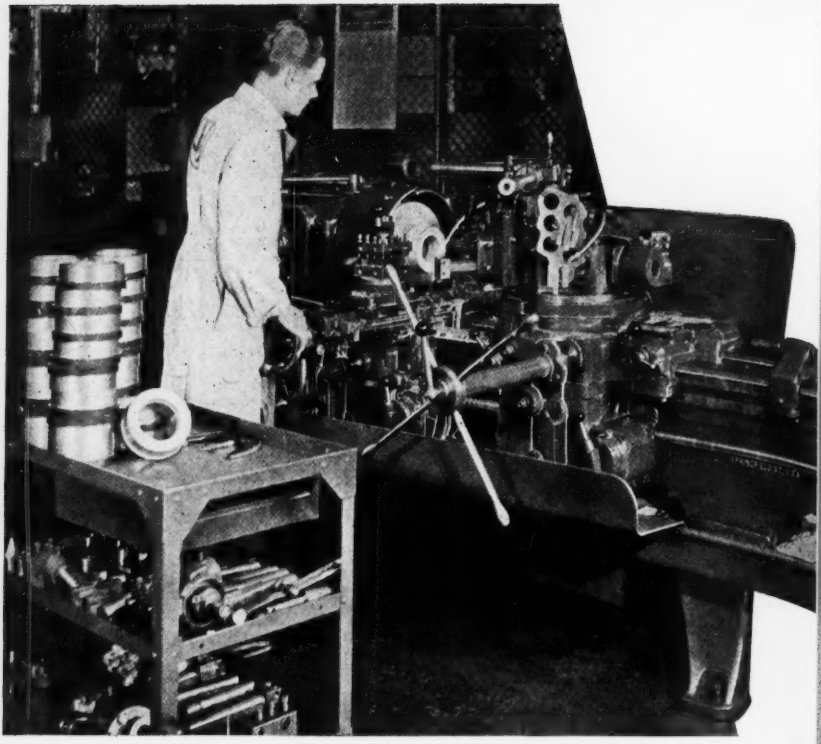
Entered as third-class matter at Cincinnati, O., under Section 574½ P.L.&R., Act of June 5, 1934)

Circulation This Issue More Than 29,000



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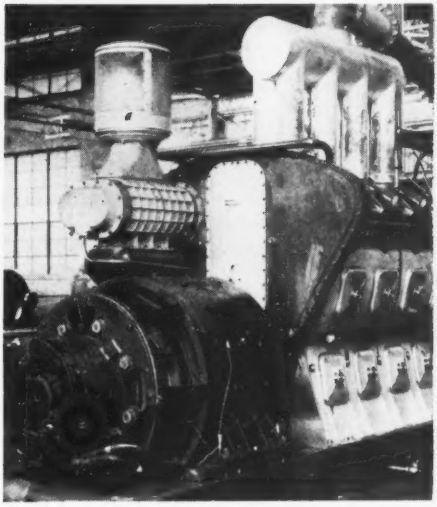
CINCINNATI, OHIO

JUNE, 1939 VOL. 12, NO. 1

Building the Diesel-Electric Locomotive



The second half of the article, describing a number of interesting operations performed at the plant of the Electro-Motive Corporation, La Grange, Ill.

By HOWARD CAMPBELL
Editor, MODERN MACHINE SHOP

THE wristpin and crankshaft bearing holes in the connecting rods are drilled, bored, and ground, in order to obtain the necessary accuracy and finish. The first and second operations are performed in the Barnes Hydram boring machine illustrated in Fig. 12. The rod is clamped in a fixture which is anchored to the table of the machine and which carries, at each end, a locating cone by which the correct center distance is main-

tained between the holes.

The cones are designed to fit the holes, one large and the other small, and each is controlled by a handwheel, as shown. Locating from the small end, the large hole is drilled

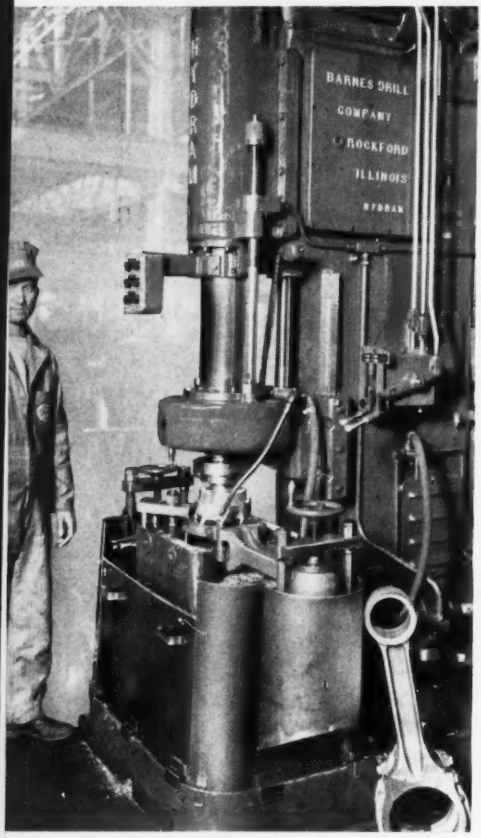


Fig. 12—Connecting rod bearings are bored in this "Hydram" hydraulically-operated boring machine.

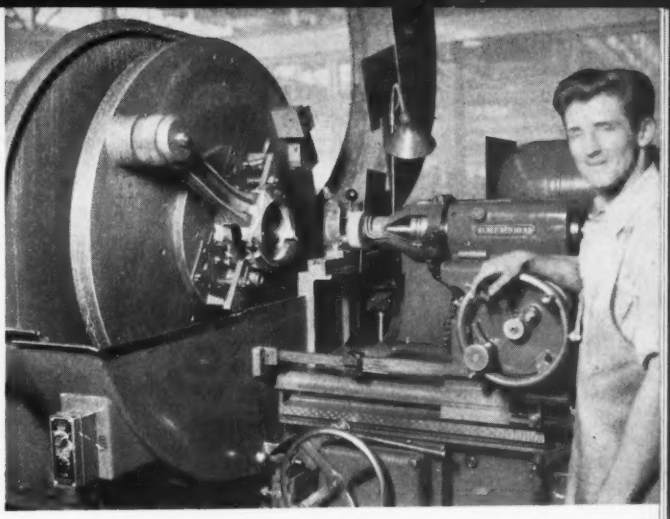
and bored, then the rod is located with the aid of the large cone and the small end is machined.

The illustration Fig. 13 shows a connecting rod set up on a Heald "Red Head" internal grinding machine to have the crankshaft bearing hole ground to size. The interesting feature of this machine consists in that when the hole is of the correct size, the wheelhead backs away and the machine stops, the entire operation being automatic. Thus no gaging is required before the hole is finished, and spoilage due to grinding the holes oversize is practically eliminated.

An important part of the locomotive mechanism is the blower, which consists primarily of the housing and the rotor, both of which are aluminum castings. The housing is rough bored on the Giddings & Lewis horizontal boring machine shown in operation in Fig. 14, and finish bored on a special horizontal boring machine which will be shown later in this article. In the rough boring operation approximately ⅛ in. of stock is removed, leaving 0.025 to 0.030 in. for finishing. Using a Carboloy fly-cutter and operating at a cutting speed of approximately 375 ft. per min., this operation moves at a swift pace.

The rotor for the blower is an aluminum casting. The blades are of the usual circular type, and each blade is finished to close limits of accuracy. The finishing operation on the blades is performed in the Rockford Hydraulic Shaper-Planer shown in Fig. 15, the rotor being swung between centers in a fixture which has a faceplate that is geared to the table drive so that the rotor is revolved as required in order to obtain the correct spiral on the blades.

The cross feed is geared to an eccentric which can be adjusted so that, as the tool is fed across the work, it is also lifted and lowered to produce an accurate radius. The amount of radius is controlled by the adjustment. Approximately ⅜ in. of stock is removed in this operation; 5/32 in.

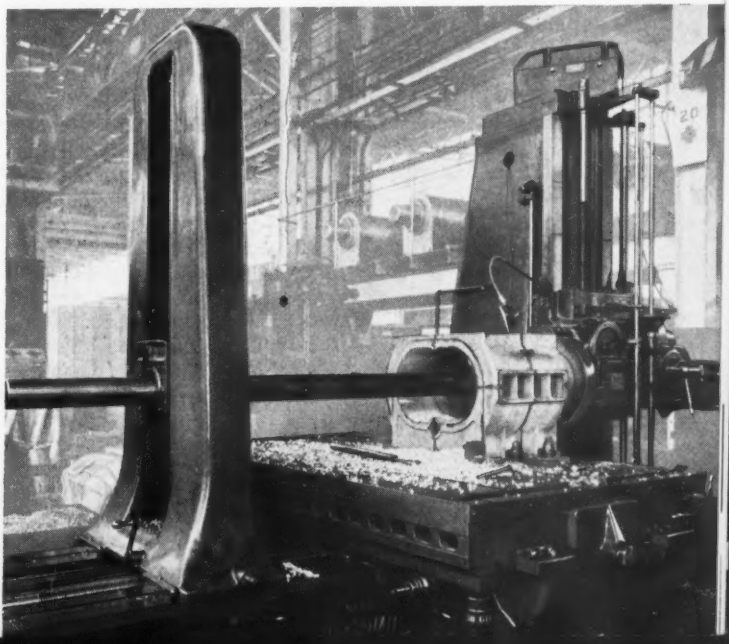


13 — A smooth finish accurate size are as- by grinding the bear- holes in the connecting on this Heald "Red ead" internal grinding machine.

which is taken off the first cut. All about 0.010 in. is moved in the second the 0.010 in. be- removed in the rd and last cut, rking to a limit of us or minus 0.002 inch.

No adjustment is made in the tting of the tool holder in order obtain the variations in depth cut, however; the tool holder re- ains in one position and three dif- ent cutters, of the sizes neces- ry to remove the necessary mounts of stock, are used. The mi-finishing cutter is 0.020 in. maller than the ishing cutter, d the finishing tter is made to ry close limits order to obtain e correct ra- us and size the finished ece.

After machining, the shafts are pressed into the ends of the shaft hole and the rotor is balanced in the special balancing machine shown in Fig. 16. The lower end of the rotor rests on a thrust bearing and each end—lower and upper is—locked between three ball bearing discs which enable the rotor to move freely while holding it in perfect alignment. In



g. 14 — Boring an luminum blower ousing to size on a orizontal boring achine. A Carboloy y-cutter is used, op- ating at a cutting peed of approxi- ately 375 ft. per minute.

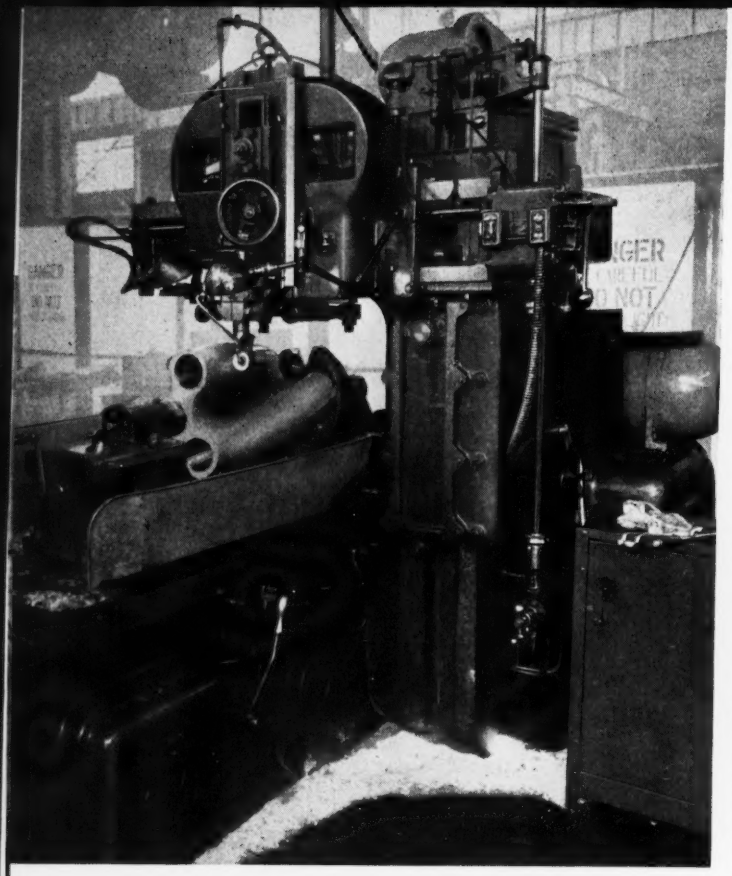


Fig. 15 — By means of an ingenious feeding device, geared in to the table feed, a perfect radius is planed on each rotor blade in this machine.

order to impart motion to the rotor, the upper end is connected, by means of a universal joint, to the driving spindle. The spindle runs at a speed of 250 r.p.m.

The bearing with which the driving spindle is connected is enclosed in a housing designed so that the driving spindle can be moved a short distance out of center in any direction. This movement is controlled by the handwheel which can be seen at the upper front of the machine, the amount of movement being indicated by graduations on the ring which encircles housing just above handwheel.

At the left side of the machine can be seen two hoods enclosing Neon lights which are connected with contacts that are timed with the graduations on the machine spindle. With the rotor to be tested in position in the machine, power is applied and the spindle starts rotating. If the rotor is heavier on one side than on the other, developing a "point of unbalance," the unbalance will cause the rotor to revolve with an eccentric motion which is immediately indicated by one of the Neon lights, depending upon whether the point of unbalance is near the lower or upper end of the rotor.

By throwing the spindle off center until a point is found at which the off-center condition of the spindle counteracts the point of unbalance in the shaft, the unbalanced point is located by means of the graduations on the spindle. Estimating the amount of unbalance, the operator applies a bit of wet clay to a point opposite the point of unbalance, adding and subtracting clay until the rotor counterbalanced to a point of

erfect balance. The clay is then eighed and metal to the exact mount of the weight of the clay is moved from the heavy spot, thus tting the rotor in balance.

The illustration Fig. 17 shows the achining of the blower end plate, he specific operation in process be- g that of boring the bearing holes r the cadmium-silver bearings with hich each end plate is fitted. Cad- ium-silver was selected for these earings because of its excep- ional bearing qualities. The achine is of special design, uilt especially for this job, nd the workpiece is held in fixture of unusually rigid esign. The clamps operate on cme square thread screws, ontrolled by handwheels as hown.

There are three bearing di- meters to be machined, each ne being bored and faced in single operation. The limit f variation allowed on each earing diameter is 0.0005 in.

To achieve the high speeds or which the Diesel-electric ocomotive is noted, all run- ing parts must be machined o close limits of accuracy nd finish. Gears, especially, must be finished to close tol- rances in order to obtain mooth action with a mini- mum of wear and noise. Ac- ordingly, the teeth of all ears are ground to size and hape in the gear grinding achine illustrated in Fig. 18.

The gear shown in process is 26 in. in diameter and has 52 teeth. The teeth have been rough-cut in a hobbing machine, leaving approximately 0.060 in. of stock to be removed in the grinding operation. The perfect involute shape is obtained with a wheel dressed to this shape, the dressing being automatic so that the correct contour is constantly maintained. When finished by grinding in this manner, the gear is as nearly

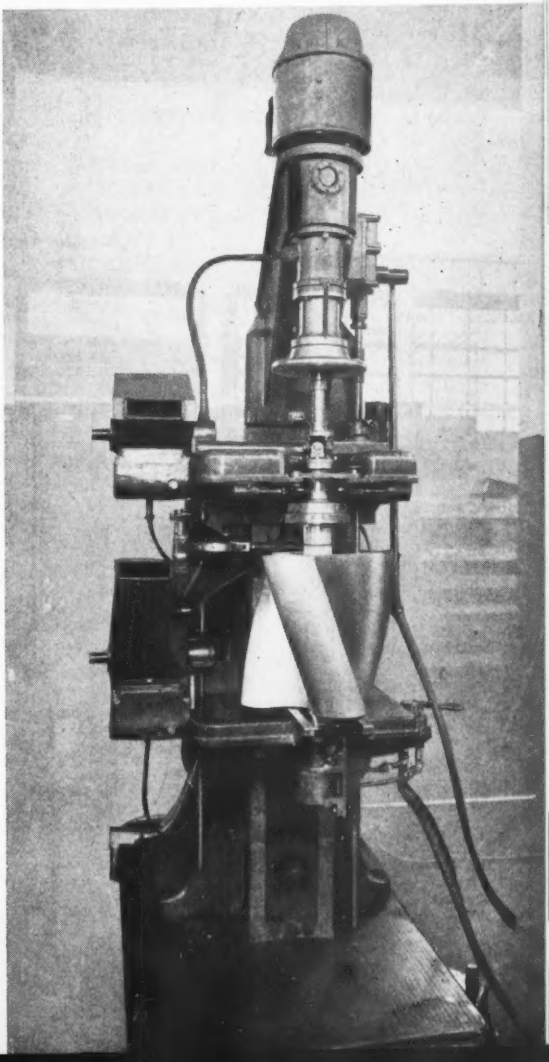


Fig. 16—Each rotor is dynamically balanced in this special balancing machine which is designed so that Neon lights indicate the exact point of unbalance at either end of the rotor.

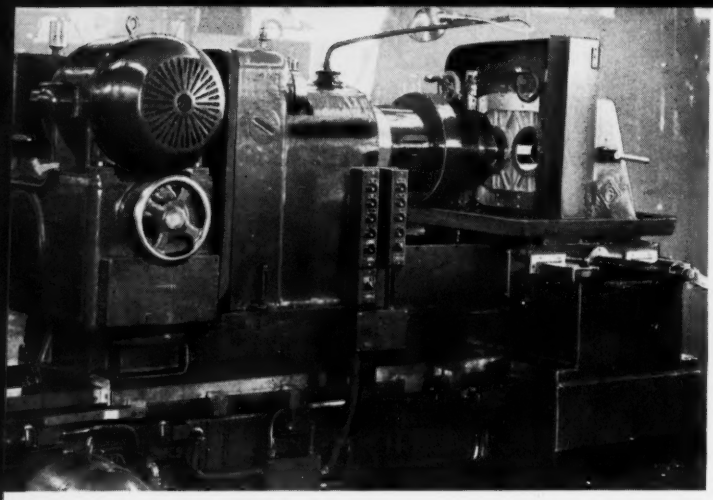


Fig. 17—Boring a facing the bear holes in the blow end plate for c mium-silver bearin The limit of variati on each bearing ameter is 0.0005 in

perfect in form as it is possible for a steel gear of this size to be.

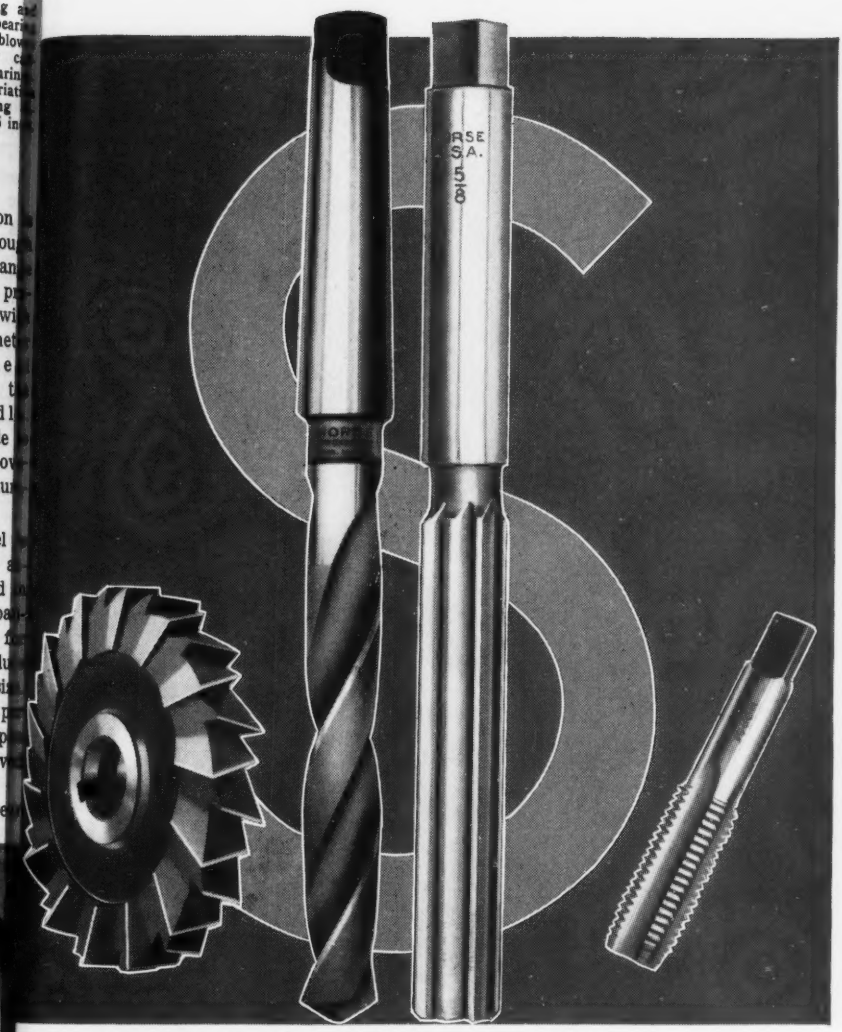
To shape the gear to the tooth form desired, the grinding wheel passes between two teeth at each reciprocation of the table, grinding the adjacent tooth surfaces and root land at the same time. Between reciprocations the work is indexed to the next tooth space and the cycle is repeated until every tooth has been ground. In fact, the process is continued until the gear has made several revolutions, which is usually necessary to remove all the surplus stock and finish all of the teeth to the correct size and shape.

The grinding wheel table is reciprocated hydraulically and the indexing, which takes place at the end of each stroke, is also automatic, being operated by a hydraulic drive cylinder. The indexing motion is obtained through a set of change gears and a precision worm wi a 38-in. diamet work whe mounted on t work spindl The change gears make it possible obtain any amount of indexing mov ment required according to the nu ber of teeth on the gear.

Periodically the grinding wheel dressed by diamond-pointed tools a tached to the machine and guided their movement by a reduction pa tograph mechanism, depending its accuracy upon master involu cams of four times the tooth si The number of dressings required p gear depends, of course, entirely up the amount of stock to be remov from the teeth.

By grinding the teeth of the ge

Fig. 18—Glass-smooth finish and perfect involute contour is assured on the gear teeth by grinding in this modern gear grinding machine.



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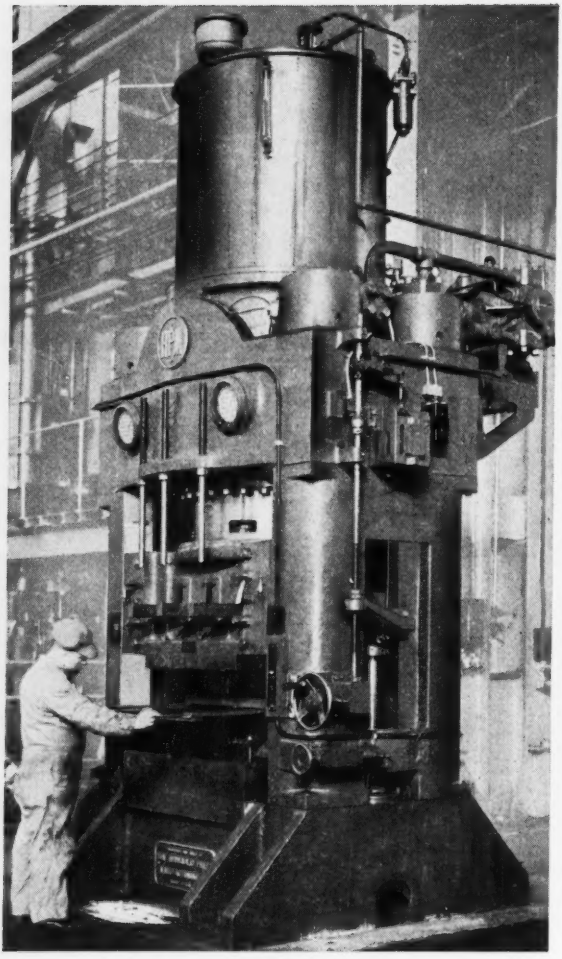


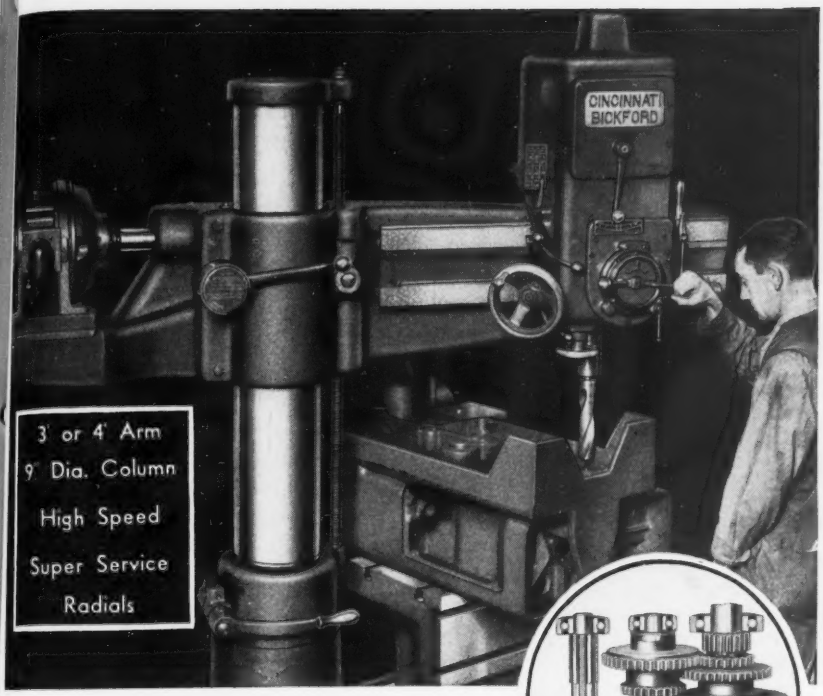
Fig. 19—This 1,500-ton hydraulic press is used for a wide variety of jobs. The operation in process is that of stamping holes in engine frame plates.

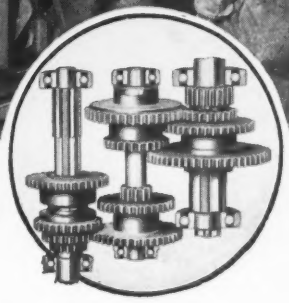
with a wheel of predetermined shape as outlined above, it is possible to produce gears with teeth that are extremely accurate in their tooth form, the involute profile, and the tooth spacing, together with very hard, long-wearing tooth surfaces. This point is very important in the high speed, heavily loaded locomotive gearing.

The illustration Fig. 19 shows an operator using an H-P-M 1,500-ton hydro-power press to stamp holes in engine frame plates. The plate is of ⅜-in. sheet steel and contains six holes of 8 x 12-in. size if for use on the 12-cylinder engine and eight holes if for the 16-cylinder engine. Although the pressure capacity is 1,500 tons to the square inch, the press is fairly rapid in action due to the fast traverse feature of the ram return. With the H-P-M hydro-electric control set for semi-automatic operation, the press ram makes a complete cycle and stops at the initial position. This press is used for a vide variety of stamping and drawing operations where a vast amount of power is required.

Locomotive axles are ground in the Norton grinder shown in Fig. 20. The axles come to the grinder in a rough-turned condition, 0.030 in. of stock being left on the bearings for removal in the finish grinding operation. Using a 4-in. wide wheel, the two bearings and two wheel fits on an axle are finished in 60 minutes.

After being assembled to the axle, each pair of wheels is ground to size in the Niles wheel grinder shown in Fig. 21. The wheels are ground si-





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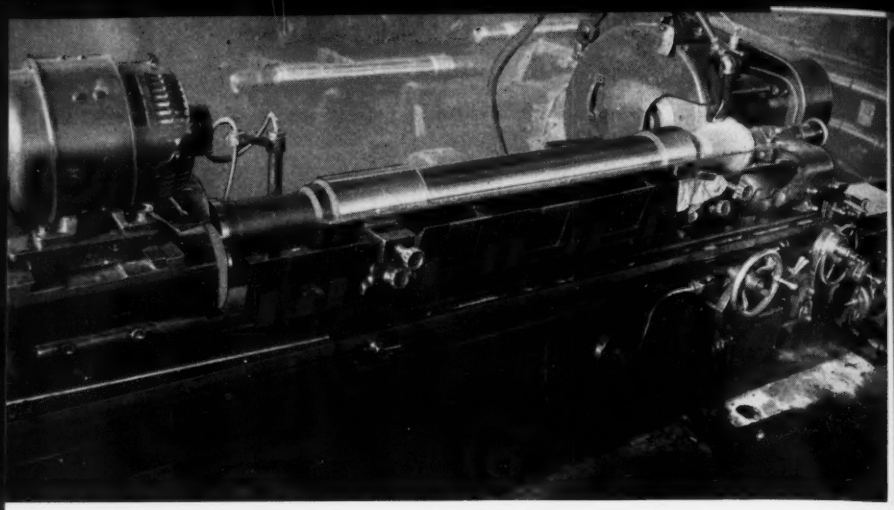
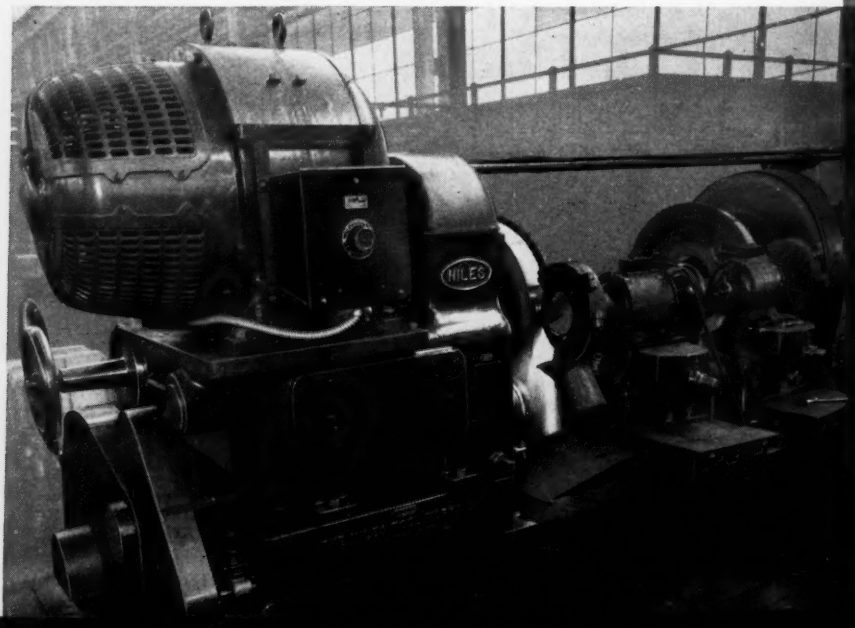


Fig. 20—Bearings on driving wheel axles are finished to size by grinding in this Norton cylindrical grinder.

multaneously, hydraulic feed providing for smooth operation and an infinite variety of feeds. The machine is driven by a 50 h.p. motor, this unusual amount on such a machine being necessary because of the heavy cuts and the double grinding job. Finishing the wheels by grinding, however, assures absolute concentricity, smoothness, and accuracy.

As each Diesel unit is completed, it is mounted on the stand shown in the illustration at the head of this article, where it is connected to an electric motor and given a running-in test before releasing for service.

Fig. 21—After the wheels have been assembled to the axle, they are ground to size in this double head hydraulically-operated grinding machine.



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Grinding Wheels for Centerless Thrufeed Grinding

Importance of Proper Selection and Correct Use of Wheels for Maximum Production

By FRANK FALARDEAU

ONE of the most frequent errors made by users of centerless grinding machines consists in the use of wheels which are much harder than they should be for the work being ground. There are two outstanding reasons for this error: (1) The hard wheel stands up well under grinding stresses, and (2) the method employed by most operators of centerless grinding machines adapts itself only to a wheel which is considerably harder than the ideal wheel for a given job. This method seems to be the conventional one, but it has been proved that it is not the best one.

The popular error referred to above seems to be based on the fact that the harder wheel wears better than a softer wheel, and leads to the assumption that the harder wheel is the more economical of the two. This assumption is not true.

"Softness" and "free-cutting" are synonymous in most cases, due to the fact that the abrasive particles of a soft wheel break away before they have become too dull. The softer wheel will, therefore, practically always permit the faster removal of stock, resulting in increased production. And production is an important fact in the gauging of wheel cost.

The softer the wheel, the greater is its tendency to produce work of high quality. Roundness, straightness, and freedom from chatter marks, scoring, or burning of the work are much more easily obtainable with soft wheels. The quality of the finish is better. The appearance of the finish obtained with a too-hard wheel sometimes seems superior, but actually this appearance is due to the fact that the hard wheel "glazes" or burns the surface.

The grinding of dental burrs, ball bearing races, and many other extremely difficult centerless jobs requires wheels, which, on ordinary work of the same size and material, would be considered many grades too soft. Rapid wheel wear is acceptable in such cases because it is accompanied by trouble-free performance and the high quality of the work produced.

A softer wheel of the correct grain and grade requires less dressing, if the wheel is correctly used. The grinding operation itself provides the dressing action if the method is cor-

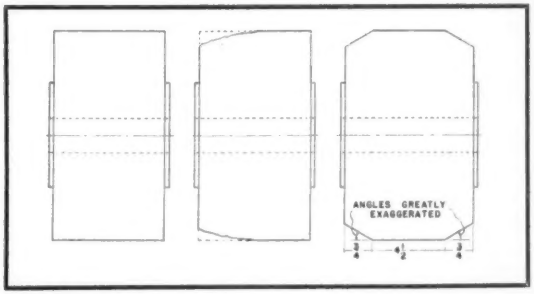
rect. Diamond dressers last longer due to less frequent use and to the fact that the softer the wheel, the less is the wear on the dresser per unit of abrasive removed by dressing. The plant of the Latrobe Electric Steel Co., Latrobe, Pa., has several centerless grinders which have been running for a number of years without the necessity of dressing a grinding wheel, even for truing up a new wheel. These machines are used for grinding long bars of steel and iron and a very fine quality of work is produced. Other machines in the same plant are equipped with diamonds which are used infrequently. The correct selection and proper use of the wheel effects a saving on diamonds.

Actually the correct wheel, although softer, will often have a life as long or longer than the usual harder wheel—if it is used correctly. While it may be worn more rapidly by grinding, the abrasive lost by dressing is saved to a considerable extent. When the wheel is diamond dressed, many unused abrasive particles are wasted. When the wheel is dressed by grinding, some return is received from each particle.

It has been stated in the first paragraph that the conventional method for using centerless wheels is not the best. This method depends upon wheel dressings which are frequently relative to the amount of stock removal. The operator dresses the wheel to sharp corners at the entering and the exit ends of the setting. He then grinds until the wheel is broken down from the entering corner to a point part way to the exit corner of the wheel. He then redresses to sharp corners. The reason why he redresses is that it is necessary for producing acceptable work. It is necessary because the wheel is too hard.

Hardness of a grinding wheel may be defined as its degree of resistance per unit area of its contact with the work to breaking down of the surface abrasive in that unit by grinding pressure.

The grinding pressure "trouble point" is the point at which chatter, burning of the work, and scoring of the work occur. The amount of pressure at this point is the total pressure between the work and the wheel. This pressure is applied to the entire area of contact of work with wheel, and this area, equal to the effective width of the wheel times the length of the arc of contact, may be many times greater than the unit area above.



(Left) — Periphery of Grinding Wheel after Dressing. (Center)—Grinding Wheel after Corner is Broken Down. (Right)—Illustrating One of the Recommended Methods.

It follows that the trouble point pressure must be greater per unit area than the hardness of the wheel as defined above. If it is not greater, then it must be applied to less wheel area so that the pressure per unit area of the wheel is increased. The increased pressure causes the wheel to break down, which makes it cut

more freely and thus reduces the total grinding pressure for the same removal rate. To accomplish the same result, a softer, less resistant wheel can be substituted.

The grinding pressure trouble point can be controlled to a limited extent. For instance, a certain amount of pressure will cause chatter on a job which is set at ½ in. above center. If the setting is lowered to ¼ in. above center, the setup will perform trouble-free, although the grinding pressure and the contact area remain the same. Similarly, a solid setting will work acceptably under high pressure where chatter would result if the setting were weak or its elements loosely c l a m p e d. Grinding pressure causes scoring at relatively low points when the bearing condition between the work and the blade is poor. The softer the blade material, the greater is the pressure necessary to produce scoring.

Everyone who is familiar with center-type grinding knows that an "N" wheel 4 in. wide will appear much harder in action than an "N" wheel which is 1 in. wide. An expert center-type grinder operator who must eliminate chattering due to a too hard wheel will relieve a portion of the wheel-width so that he has, in effect, a narrow wheel—which acts softer. When his wide wheel is correct for the job and chattering is due to some other cause, the trouble is often overcome by cutting down the width of the wheel. This is additional evidence that softer acting wheels produce better results regardless of the source of trouble. The improved action obtained by narrowing the wheel also illustrates the effect of applying the load to less wheel area.

The centerless grinder acts the same in this respect. When the centerless grinder operator dresses his wheel after it has worn from the entering corner to a point part way to the exit corner, it is because the worn section, which is the effective section or width of the wheel, is too wide for a wheel of that grade on that work. He dresses to narrow the effective width of the wheel so that the grinding pressure will be applied to less wheel contact area, as a result of which the wheel will act softer.

If a 6-in. wide wheel is not too hard, when the full width of the wheel is used, dressing is unnecessary on roughing cuts because the wheel, being soft enough, will be broken down at a uniform rate by the grinding action. As the abrasive particles remove stock, they become dull. As they become dull, the grinding pressure between the work and the wheel increases. If the wheel is soft enough, the dull particles break away before the grinding pressure has reached a point where it will cause chatter, burning and scoring. When the dull particles break away when the pressure is only slightly less than that which will cause troubles, the wheel is the most nearly correct for the job. If the wheel is too soft as a 6-in. wide wheel, then it will break down too rapidly or at too low a grinding pressure.

When a 6-in. wide wheel is used efficiently, all of the 6 in. of its width is actually removing stock, throwing sparks. Thus all of its width is "broken down" so that no part of the dressed surface remains. It follows that a wheel which is correct as a 6-in. wide wheel is much too soft if only a portion of its width is used. This using of only a portion is the conventional method, usually adopted because the wheel is too hard. In order to obtain maximum life from the softer wheel, its entire width must be used.

The following method for roughing

s suggested:

1. Set up in the usual way, except or dressing. Dressing should not be ecessary, since the grinding action ill profile the wheel to the correct orm.

2. Grind at the average rate to tart. Removal of 0.010 in. at three-egree feed angle and at 52 r.p.m. s a good starting rate.

3. Pay no attention to the rate of heel breakdown until all of the dia-ond dressed surface has disap-eared. The wheel, if too hard for s width, will then glaze and cause rouble. If it is too soft it will reak down too rapidly. To correct ither condition, it is necessary to hange to another wheel, or to change the grinding rate to suit the present wheel. In the case of a wheel which is too soft, the rate suitable for the wheel will be slow and unproductive. However, chang-ing the rate will usually be possible in the case of a wheel which is one or two grades off.

A. If the wheel is too soft, lighter cuts must be taken, and, or, slower work r.p.m., and, or, less axial feed (feed angle) per revolution of the work. These reduce the load im-posed on the wheel and therefore cre-ate less grinding pressure.

B. If the wheel is too hard, then increase in order (a) r.p.m. of work (limit is usually chattering point), (b) depth of cut (limit determined usually by the ability of the setting to produce required roundness), (c) feed angle (limit is operator's ability to load).

All of the above has its application to thrufeed rough grinding only. In-feed or plunge cut is not considered here. Thrufeed finish grinding can almost always be easily accomplished by using the same setting and wheel but by varying the method. The only changes necessary are to dress the grinding wheel correctly and to take lighter cuts.

The correct dressing of the grind-ing wheel for finishing is obtained by swiveling the truing device until the wheel, if 6 in. wide, will have an effective width of about 4½ in. In other words, when the wheel profile is correct for finishing, the first piece passed through after dressing the wheel will be sparked the full 4½ in. of the wheel's width. The size of the work and the finish obtained will be uniform until the wheel has worn to the point where it has an effective width of 6 in. Redressing is then necessary for obtaining finish.

A good 6-in. wide roughing wheel will remove at least 0.010 in. per roughing pass on work of average diameter size (1¼ in. or less). Re-moval of 0.015 in. is usually obtain-able. Removal of 0.060 in. is un-usual, but is in some cases being accomplished. The 6-in. wide wheel which will take these roughing cuts without breaking down too fast will hold up very well on the lighter fin-ishing passes even though the effec-tive width is reduced to 4½ inches.

The correct grade of wheel to be used can be found by first trying any wheel, preferably one recom-mended by a wheel or grinder expert. Experiment with this wheel along the lines described above on a job which is about the average of the work to be handled. For instance, one wheel will often be adaptable to all soft steels, irons and brass. Try the starting wheel on a soft steel job which is of average diameter size and which is of about average material. This wheel may be found to act cor-rectly on a setting by which 0.010 in. is removed at 52 r.p.m. and three degree feed angle.

If the total stock to be removed is 0.017 in., an attempt should be made to remove it in one 0.014 in.

roughing pass and one 0.003 in. finishing pass. If the wheel breaks down too rapidly under the 0.014 in. pass, then try a slightly harder wheel. When the correct wheel is found to grind this job, it can be applied successfully to other jobs in the same class by varying the load imposed on it through varying the depth of cut, speed, and so on. If the wheel acts correctly on the average job and fails to break down at the same rate on another job, increase the production rate to increase the stresses on the abrasive particles.

Individual opinions vary as to the type of wheel that is best for thrufeed grinding. The best wheel is, of course, the one whose abrasive particles retain their efficient sharpness under a given condition better than does any other. The wheel must have a bond which does not interfere with the efficiency of the abrasive and which will release the particles when they become dulled. Rubber bonded wheels have been found to work out somewhat better than others on thrufeed when used correctly. These wheels, however, have their application only to thrufeed grinding. They do not usually work as well on infeeding as do the vitrified wheels.

Ball Bearing Ideas by New Departure Engineers. A 20-page catalog containing applications representative of the manner in which ideas conceived and developed by New Departure engineers are carried forward to the practical use of the machine builder has been issued by The New Departure Mfg. Co., Bristol, Conn. The use of bearings in universal milling machine attachments, universal milling machine heads, lathe spindles with cone pulleys, precision bench lathe spindles, work heads for die forming machines, wheel spindles for thread grinders, spindles for tool post grinders, spindles with sleeve-mounted pulleys, boring machine spindles, drill spindles, and lapping machines are illustrated and described in detail. Copy free.

Molybdenum Steels in Oil Production. The Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y., has published an attractive 30-page catalog discussing Molybdenum steels and their use in oil production. The various series of Chromium, Manganese, Nickel, Nickel-Chromium, and Silicon-Molybdenum steels and cast steels together with their uses are described in detail. In addition, the catalog contains numerous illustrations showing various oil field equipment which has been made of Molybdenum steels.

Copy will be sent free to any mechanical executive who will address a request on his company letterhead.

Lighting for Production in the Factory. A 40-page bulletin discussing the factory lighting problem in terms of new knowledge of seeing is now being issued by the General Electric Co., Nela Park, Cleveland, Ohio. Among the topics discussed are quality of light, quality of lighting, glare, quantity of light, checking and specifying lighting, lamps and their application, lighting equipment, general lighting for ordinary seeing tasks, supplementary lighting for critical seeing tasks, office lighting, and industrial yard lighting. The bulletin is profusely illustrated throughout, and, in addition, contains several pages giving recommended standards of illumination for industrial interiors, and supplementary lighting recommendations. Copy free upon request.

"Esso Cutting Fluids" is the title of a 16-page pamphlet now being distributed by the Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y., covering recent developments in cutting fluids and their selection for particular machining operations. Of special interest is the development of a new type cutting oil for use in machining tough steel alloys. Numerous illustrations showing the use of Esso cutting fluids in performing, such operations as turning, shaping, planing, drilling, reaming, threading, tapping, and so on, are included in the pamphlet.

In addition, the pamphlet contains a description of the Standard line of cutting fluids, including the straight and sulfurized fatty-oil mineral-oil blends, and the Standard line of transparent and soluble oils. A complete table of recommendations for cutting fluid applications is also given. Copy free upon request.

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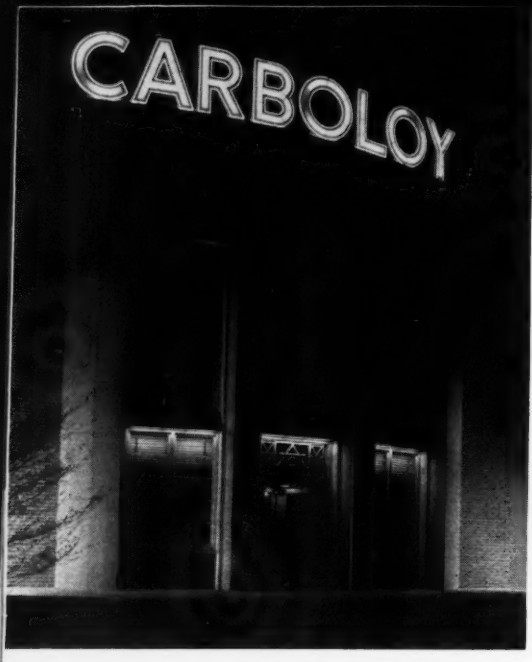


New Carboloy Plant Excellent Example of Modern Layout

IN the new plant of Carboloy Company, Inc., which was formally opened on June 1 at Detroit, Mich., have been combined all the manufacturing facilities which were formerly divided among plants in Cleveland, Detroit, and Stamford, Conn., forming the largest plant devoted to the manufacture of cemented carbide products in the United States. The total area of the plant is 121,750 square feet.

Designed for the quantity production of cemented carbides, the unusually extensive facilities of the new plant are indicative of the anticipated trend of the use of cemented carbides. Equipment now installed and planned for the immediate future is said to be capable of producing approximately ten times the amount of Carboloy currently consumed by industry.

The administration building is of reinforced concrete, completely air-conditioned, with acoustical ceilings in halls and offices. The factory proper is a monitor-type, one story, all-welded steel and brick frame structure containing complete facilities for the manufacture of Carboloy from the raw materials through to the finished tools, dies, and wear-resistant parts. A completely equipped research laboratory is conveniently located within the factory building to provide for numerous functions such as particle counts of powdered metal under magnification, microscopic structure analyses of hardened Carboloy bars, chemical analyses, various kinds of tests, and so on.

The powder-metal department is reached through air locks, installed to ensure uniform operation of the air-conditioning system which closely controls atmospheric conditions in this section. Constant temperatures and humidity levels are maintained here for accurate weighing and blending of the powdered metals. Connected with the metal room is the press room, in which two 300-ton presses provide for the production of

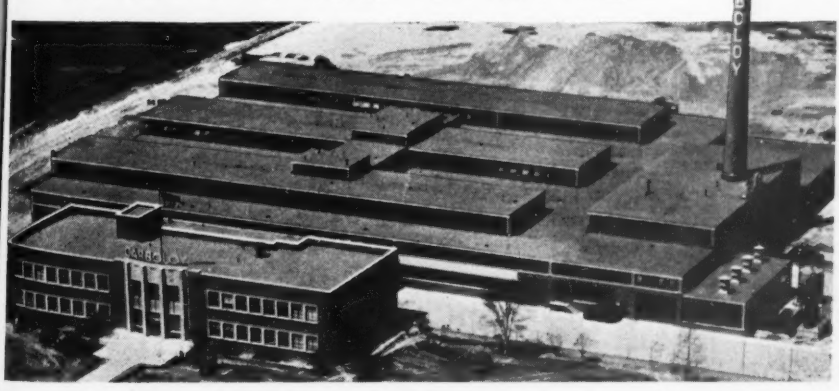
This operator is inserting a "boat" of pressed Carboloy rings into an electric furnace for the semi-sintering process. This department includes 18 furnaces for reduction, carburizing, semi-sintering, and sintering. Individual meters control hydrogen for each furnace.

ingots up to 20 square inches in area. Additional facilities provide for the production of larger or unusually shaped sizes. Two supplementary continuous presses are available for future requirements.

A battery of 18 furnaces provide for reduction, carburizing, semi-sintering, sintering, and brazing processes. This battery is supplemented by several additional furnaces maintained in other departments for brazing of tools and hot forging of die cases. All heat-treating operations are definitely controlled by temperature recording control instruments and individual hydrogen control meters for each furnace. Hydrogen is used for all processes in which a non-oxidizing atmosphere is required. The desired standard of quality and uniformity is maintained by the use of special equipment to produce hydrogen with a high degree of purification and dryness.

The forming department is equipped with a variety of machine tools with which the semi-sintering ingots and special blanks are machined to the shapes desired. While the Carboloy blank is being processed, the steel shank into which it will be brazed is being machined to the size and shape required in the milling department. Adequate lighting facilities are provided, all parts of the factory, ex-

New Plant of Carboloy Company, Inc., at Detroit, Michigan



Grinding department, in which batteries of hydraulic surface grinders, universal internal and external grinders, special cutter grinders, diamond lapping machines, and so on, are used to perform the final finishing operations.

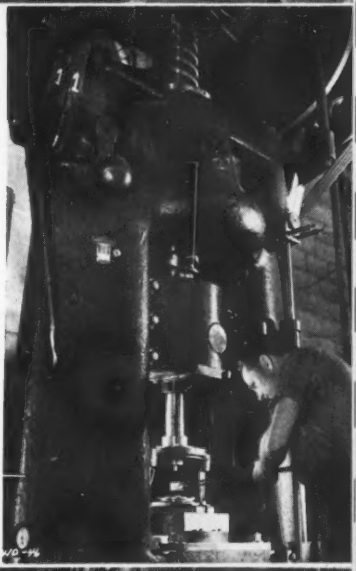
cept the powdered metal department, being illuminated with G-E high intensity mercury vapor lights consisting of 400-watt units spaced on 10 x 15-foot centers at a height of 15 feet. The powdered metal department contains one of the first installations of the new 100-watt Cooper-Hewitt fluorescent lamps made for production precision operations. These lamps provide 40 to 50 foot-candles of light at the working plane.

As the Carboloy tools come from the brazing department, they are passed to batteries of hydraulic surface grinders, universal and external grinders, special cutter grinders, diamond lapping machines, and other machines in which are performed the final grinding operations necessary to produce a finished tool. Carboloy wire, bar, and tubing dies are segregated from the production of Carboloy tools, to be finished in the die department. Adequate facilities are maintained for sectional and shaped die manufacture. Of particular interest are the facilities for hot forging the die castings around the nibs —an exclusive Carboloy process in which a 250-ton percussion press is used.

A completely equipped inspection department provides for routine in-

Powder metal room. This room is completely air-conditioned to maintain a constant level of temperature and humidity. A new type of fluorescent lamp provides 40 to 50-foot candles of light at the working plane.

(Above) — General view of furnace room. The atmosphere in this room is filtered to prevent contamination of powdered metals.



(Right) — Hot-forging the metal casing around a Carboloy die nib, for which a 250-ton percussion press is used.

(Below) — Internal view showing approximately one-third of new Carboloy plant. Shown here are the die, grinding, and milling sections.

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Numerous conveni-
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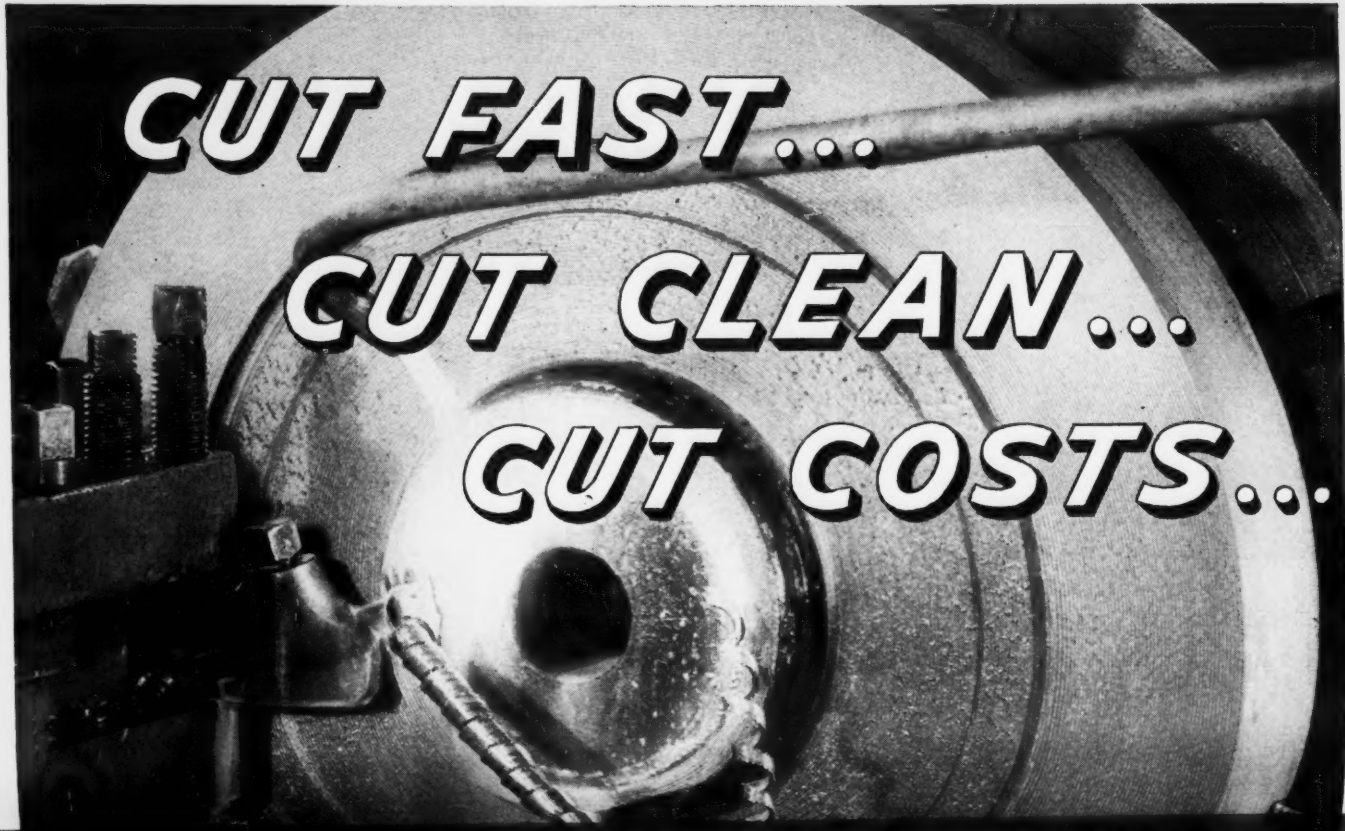
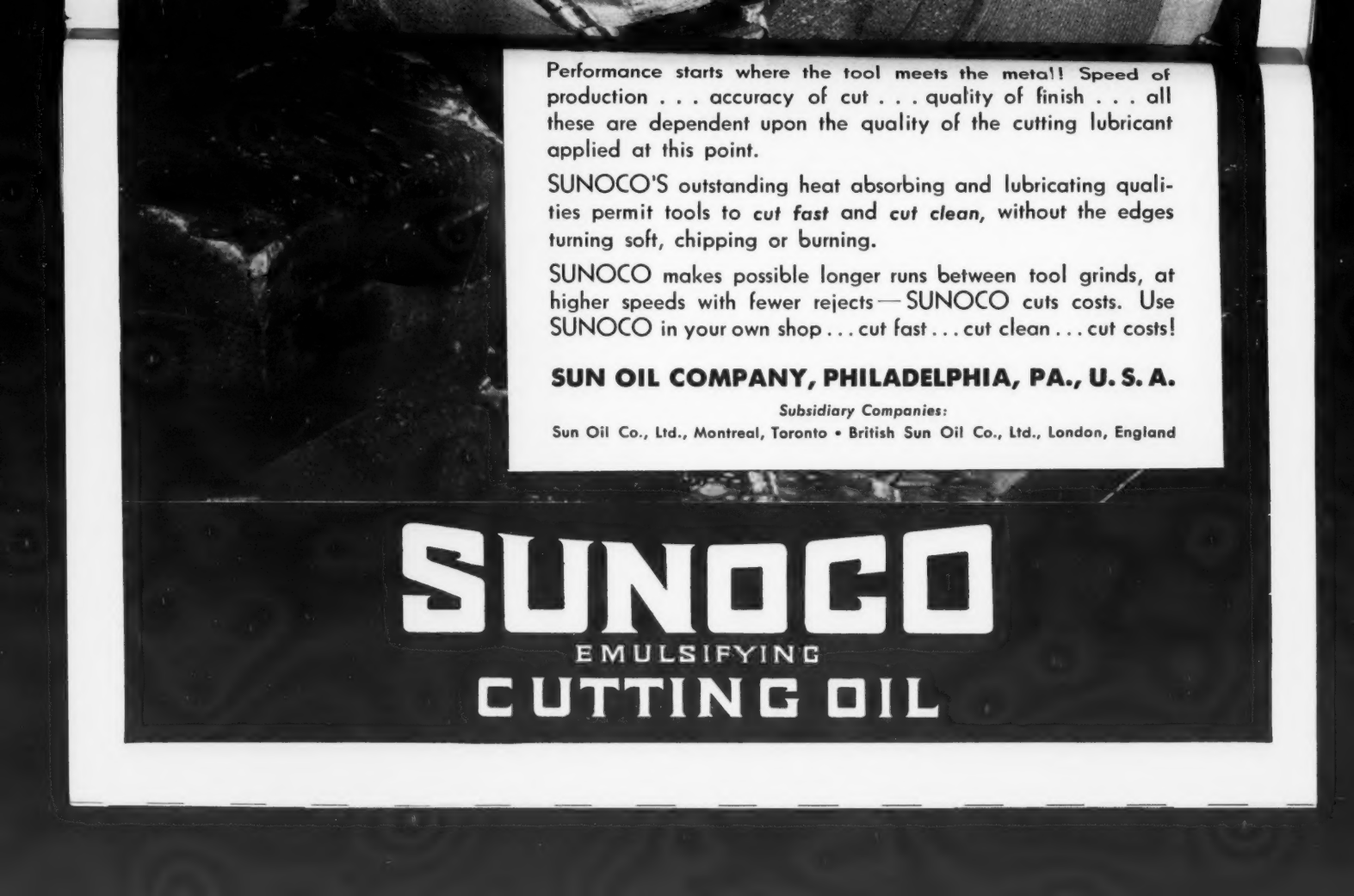


Performance starts where the tool meets the metal! Speed of production . . . accuracy of cut . . . quality of finish . . . all


Performance starts where the tool meets the metal! Speed of production . . . accuracy of cut . . . quality of finish . . . all these are dependent upon the quality of the cutting lubricant applied at this point.
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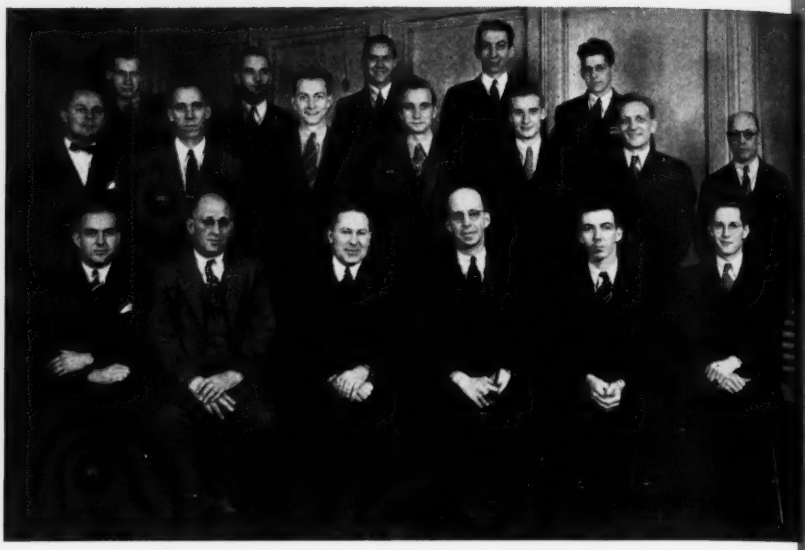

Farrel-Birmingham Evening Study Group

In this article the author explains the operation of such a group and the benefits that accrue both to the employer and the employee.

By WALTER L. TANN
Planning and Control Engineer, Farrel-Birmingham Company, Inc.

IN the second of the two articles on "Employee Education Methods at Farrel-Birmingham," published in the March and April, 1939, issues of this magazine, reference was made to an Evening Study Group. Since publishing these articles, the great number of requests that have been received for information concerning the operation of this group have indicated the interest in this subject and, accordingly, it has been decided to publish a third article presenting an outline of the activities of this group.

With a carefully planned and administered apprentice training program in successful operation, the advanced training group giving further trade education to graduate apprentices; the supervised instruction of learners, and the specialized courses of study being followed by individual workmen, it would seem

t our plan for employee training s well-rounded and embraced all ployees usually considered within scope of industrial training. wed solely from the point of pro- ing trained men, broadly experi- ed in our particular requirements, make our castings and weldments, rate our machine tools, and erect service our broad line of prod- s, it would appear that we have ered all classes of employees. But to this point we have concerned selves with the shops alone, and ry industrial executive knows that takes more than a trained shop rsonnel to effect a real industrial anization.

Instructions to the shop are issued the form of blueprints and order ets emanating from the engineer- g department and in the form of eration tickets and instruction eets from the planning and control partment, plus, of course, the ver- bal instructions supplementing these. Considering the broad range of products that we manufacture, it will be apparent that all personnel assigned to the planning and control department must be familiar not only with the details of their particular jobs, but that they must have an especially broad knowledge of the heavy machinery we build and its uses in our customers' plants.

In addition, they should be familiar with the "bottle necks" that are liable to occur at some point in the manufacture of our products; the interdependence of one department on others; the necessity for maintaining schedules from the standpoint of company collections as well as that of the sales department in living up to delivery promises they have made the customers; the necessity for issuing engineering purchase requisitions promptly when raw material has to be purchased in a rising mar-

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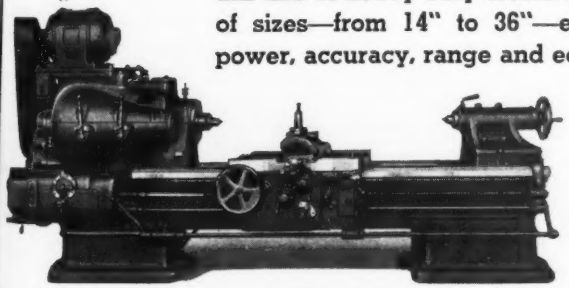

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ket—in short, they should be able to see the whole picture of modern industrial organization and management and the relation of their particular jobs to the organization as a whole. All of these important functions and many more, may, of course, be enforced by orders and directions, but it is one thing to have a man perform his duties because he is told to perform them a certain way, and quite another to have him perform these same duties with a full knowledge of their relations to sales, engineering, purchasing, manufacturing, traffic, and accounting departments.

Any plant that could boast of one hundred per cent attainment of the knowledge outlined above by its production staff would be Utopia indeed, but about a year ago the writer became impressed with the desirability of at least making a start toward this goal and formed a round-table discussion group with a half dozen men who had enthusiastically responded to personal inquiry as to whether or not they would be interested in forming and attending such a discussion group. Within two weeks after the original group had been formed, we had applications from approximately twice the original number and from these selected enough to make an even dozen.

The formation of such a group is a job in itself, because great tact must be exercised or the very men who need the advantages of such a discussion group may misinterpret the invitation to join. In every plant there is the small nucleus of "pluggers"—the sort that hang around for a few minutes after the whistle has blown and talk shop—what happened that day—the plans for tomorrow, and so on. One night the writer broached his plans for an evening study group to this post-whistle gathering and was surprised with the alacrity with which his proposal to form such a group was taken up. Word was passed the next day to the eligible and immediately it was evident that here was something that was going to fill a want that no one had really thought existed, at least to that degree. A preliminary meeting was soon held, at which time it was carefully explained that participation in and attendance at such group sessions would be entirely voluntary and that it would mean one evening a week for the session, plus the necessary time to devote to study and other preparation.

The writer suggested that the group pursue a well-ordered course of study in Industrial Managment using a standard text as a basis, but emphasized the fact that the greatest value to the group would come from close questioning and discussion as to how the principles of any particular division of this rather broad subject could be applied to the every day jobs of the group members, and further, an examination into the practices of our company with respect to the principles and practices described in the text.

This tentative proposal met with approval from the group and we began our work. Each man purchased a copy of the textbook and we held our meetings in the office of the Vice-President in Charge of Manufacturing. Sessions began early in the evening and continued for two hours, thus breaking up early enough to insure a good share of the evening remaining for other activities. In that way the members felt that they were not sacrificing any time that perhaps should be devoted to social or family obligations.

Outline of Subjects

An outline of the subjects offered may be of interest and will indicate the broad picture we were endeavoring to present. The first, or basic

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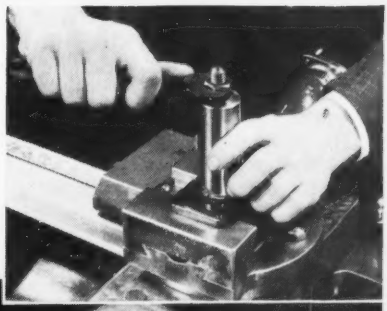

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subjects, gave the background of all industry, tracing the story of handicraft production and the beginning of the factory system; the development of tools, the great inventions and their effects, the growth of industrial enterprises based on geographic influences, the beginning and growth of specialization, and division of labor.

With this historical background, we passed on to the formation and maintenance of business policies; the various forms of industrial ownership, the location and arrangement and construction of industrial plants, the principles of organization (with a thorough study of our own organization and our organization chart), the co-ordination of departments for executive control, classification and identification, an extended study of the control of production, standardization, time and motion study, purchasing, stores and stock, inspection, and an especially complete study of cost finding, with full illustrations as to why the obtaining and correlation of certain figures is necessary, depreciation, policies governing the selection, the use, and retirement of equipment, the effects of taxes on industry, labor and public relations for industry, and finally a broad survey of the probable future of industry as evinced by present-day technological and sociological tendencies.

A study was also made of the various methods of wage payment, investigating several well-known systems and comparing them with the one in use in our plant. All topics were fully covered by texts, current articles and clippings.

Method of Presentation

Each major topic was presented with the aid of the head of our department in charge of that work. For instance, the chief engineer had charge of the session devoted to the location, arrangement and construction of industrial plants; the general purchasing agent furnished the subject matter for our session on purchasing, the cost accountant acted as leader of the sessions devoted to cost finding and depreciation. Every effort was made to amplify and apply the text matter of the course to our daily problems in our plant, but at the same time a constant endeavor was made to free the group sessions from any similarity to a school classroom session.

It was impossible to complete the entire program during the first season's meetings due to the fact that we discussed each topic as long as we felt that we could do so profitably. We have again started our course, this, the second year, and are continuing to follow the outline given in the preceding paragraphs. This year we are showing motion pictures of the manufacturing processes of various industries, particularly those to which we furnish equipment, or which furnish raw material or finished parts or equipment to us. We continue to have, as leaders of the discussions, various department heads in our plants and are also having our President, Mr. N. W. Pickering, meet with the group several times and act as discussion leader on industrial economic topics of timely importance.

Personnel of Group

It will be of interest to list the positions held by the men attending this evening study group and to note the broad cross section of the personnel of a representative manufacturing plant. These men are sufficiently interested in their company and their jobs to devote at least one evening a week to a close study of it, to the end that they may have a greater understanding of the company's problems as a whole, and gain

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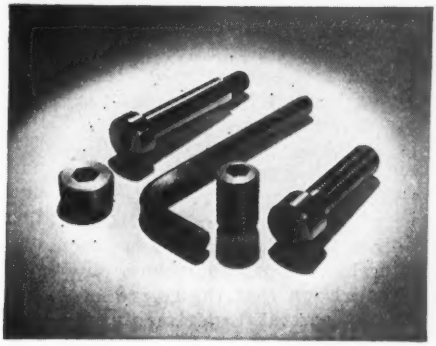

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a better knowledge of the relation of their department and their jobs to the complete organization. We find the dispatcher from the machine shop production office; a production follow-up man; an assistant foreman of the welding department; methods engineers; welding department timekeeper; assistant to the manager of the foundry department; a router and time setter from the methods division; sales engineer from the foundry and welding departments; assistant to the manager of the roll department, and several student engineers regarding which last-named group more will be said a little further along.

Benefits

It has not been difficult to evaluate the results of this evening study group, even though they are written in terms of human reactions rather than in terms of increased production, which we might expect of a similar effort among a group of shop employees. A better understanding of the other fellow's problems is evident, morale is high and there has been a realization that the co-ordination of the several departments of a manufacturing plant is an intricate job, needing the intelligent assistance of all.

As the founder and discussion leader of this particular group, the writer finds the time spent to be well worth while from both the viewpoint of the development of this small group and also the fact that he is receiving an education from them in the refreshment of viewpoint and outlook on today's industrial and economic problems. He heartily recommends to any interested plant executive the formation of such a group and its continuance under like auspices. The response and interest will amaze you, as it did the writer, and will bring home the truth of the saying that "the pay is not all in the envelope" because these young men are definitely proving that they are their fellows in similar positions in industry today are sincerely interested in their jobs far beyond the pay-check.

Given a chance at a round-table such as the writer has described, they will ask questions and get answers concerning problems that are not their immediate daily task, but are all tied in with this somewhat nebulous thing we call "organization spirit." Build this on a framework of a carefully arranged course covering the basic principles of organization and management that are the foundation of any business enterprise and you will have an educational project that will have far-reaching and lasting effects. The benefits will be not only to the participants and their work, but to the community and organization that employs them and within whose plants they are spending a great part of their working lives.

LeBlond Super Regal Lathe. The LeBlond Super Regal Lathe, built in 13, 15, 17, and 19-in. swings, is described and illustrated in a six-page folder now being issued by The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Copy free upon request.

"Modernizing Industry With the Electric Eye" is the title of a brochure now being issued by the Lipman Engineering Co., 415 Van Braam St., Pittsburgh, Pa., covering the Lipman Type PC-3 High Speed Photo Electric Counting Equipment. Features of the Type PC-3 Photo Electric Amplifier and Contact Relay Unit such as construction, operating speeds, operating range, adjustments, power handling, power requirements, tube complement, operation, and so on, are included in the brochure. Lipman Type LS-2 Light Source and Type CB-4 Control Box are also discussed. Copy free upon request.

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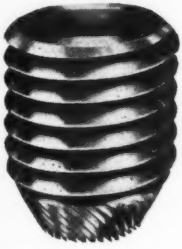

Fig. 1645
Pat. Applied For

Once set up in the ordinary way, these screws will not shake, jar or vibrate loose, yet they can be easily removed for adjustments with the usual hex bar-wrench and re-used again and again. The experience of the many users in a wide variety of industries is proof. Don't risk trouble . . . specify and get "Unbrako" Self-Locking Hollow Set Screws. Write now for samples.

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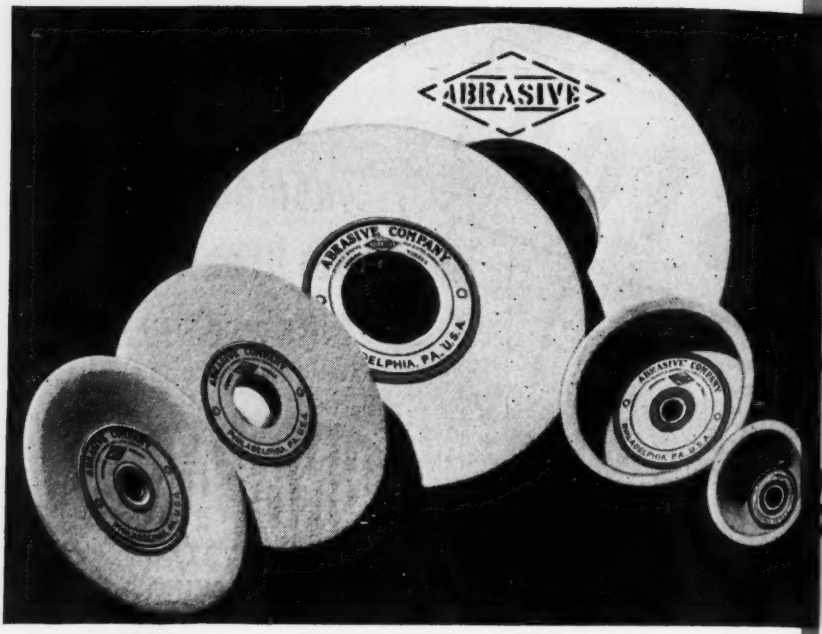

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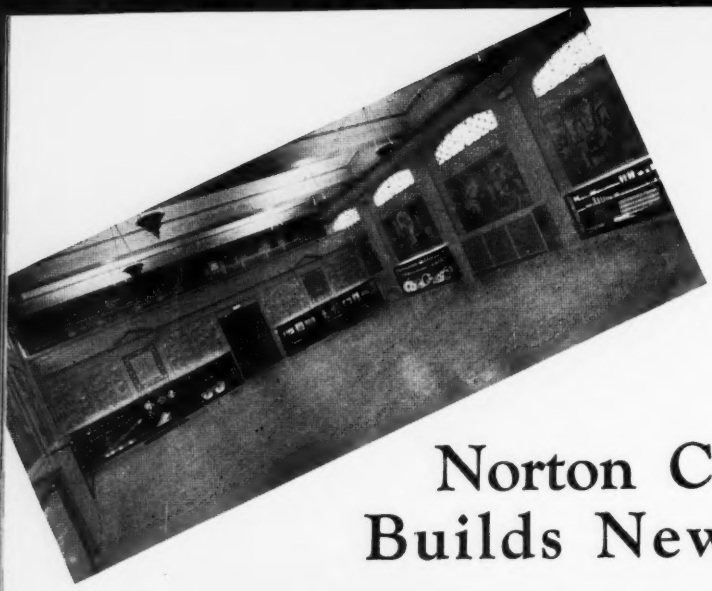
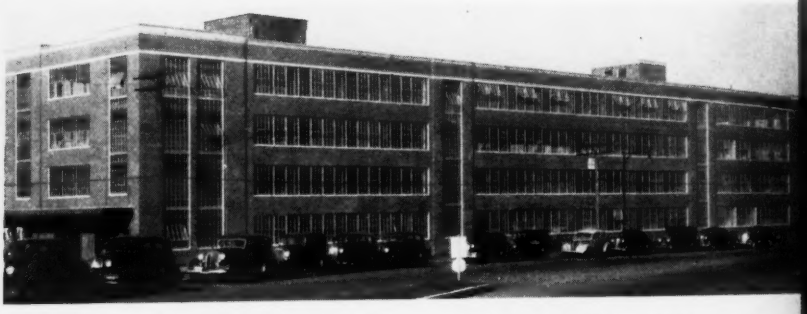
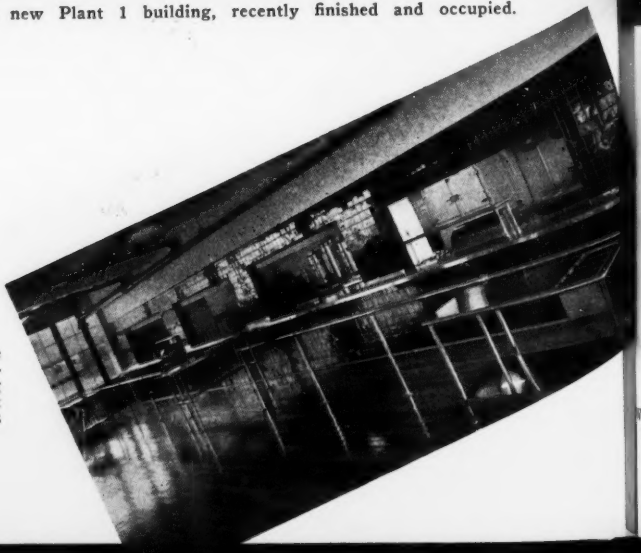


Partial view of Norton Hall. Murals on the side walls feature operations in the manufacture of grinding wheels, and glass cases display the finished product.

Norton Company Builds New Plant



The new Plant 1 building, recently finished and occupied.

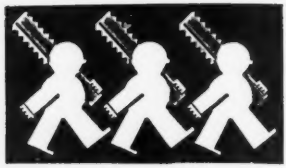


This modern service counter is an attractive and interesting part of the equipment in the workmen's cafeteria.

noon-hour scene in the
workmen's cafeteria.

General view in the department where abrasive wheels are trued and finished.

Washroom and locker
room in Plant 1.



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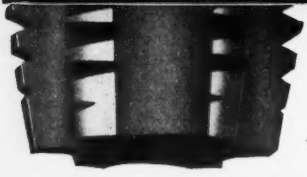

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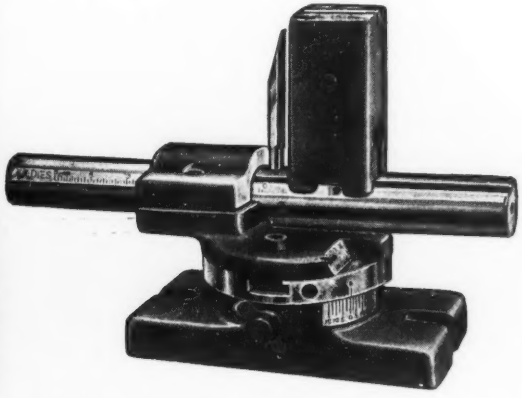

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Reminiscences of a Roving Mechanic

In which the author tells how a railroad track was pulled apart to supply repair parts for the locomotive.

By PAUL C. BRUHL

I REALLY wanted to become an interpreter instead of a mechanic; I had my mind set on learning seven languages, but my father insisted that it was more important to know how to use the head and hands than it was to know how to use the mouth. Thus I was contracted into an apprenticeship to a small machine shop in my home town and emerged, after three years of hard work and plenty of abuse, a full-fledged journeyman.

Working with my hands at a wide variety of tasks had taught me many things, one of the most important being that one learns a great deal more by doing a job than by reading about it and that even the most difficult problem somehow solves itself through continuous attack, whereas it often seems to become more difficult when one tries to find the solution by pure meditation.

Another truth that eventually dawned upon me was the reason why I had wanted to become an interpreter. An interpreter, I thought, travels all the time—and that would just suit me. So I persuaded my father that, even at seventeen, I was old enough to know what I wanted to do and started out to see the world with his blessing, but also with the admonition not to write home for money.

My first stop was a city about a hundred miles away, where I gathered a little experience and earned a little money to carry me on to another city. This experience has been repeated many times over a period of years. I have worked as a mechanic in more than twenty countries, I have served on ships and thus spent some of these years on the seas. Altogether, the number of places I have worked are too many to recall.

Traveling around so much I naturally met many fellow mechanics, one of the grandest of whom was Sandy McInnes. I ran into Sandy in a train pulling out of Lima, Peru. The train was headed for Huacho, about a hundred miles north, and I was headed for the oilfields of Talara, about seven hundred miles north on the west coast of South America. A mechanic could get 10 sols a day in Talara, whereas the job I had left in Gallo had paid only five. Sandy McInnes had been working in the copper mines of Chuquicamata in Chile, but the senoritas of Gallo had relieved him of his money and now he was in search of a good-paying job again. When I told him about the opportunities in Talara, he was at once ready to join me.

Sandy was a man of wide experience, trade and travel-wise. Before

the war he had worked in most of the machine shops of Europe and during the war had been in Australia. He had held a third engineer's job on a cattle boat, but left the boat at Buenos Aires to cross the Pampas and Cordilleres into Chile. In Chuquicamata he had repaired hoists, pumps, steam engines, and so on, at good pay, but when he heard me telling him that I had made five U. S. dollars a day in the Patagonia oilfields, including room and board, he was at once for going to Patagonia. However, I convinced him that the climate there was pretty rough and that Talara would probably pay as much. If it wouldn't, we could always try Maracaibo or Tampico. So Talara became our common goal.

The train was filled with natives who had been to a bullfight in Lima that afternoon, and they were enthusiastically reliving each individual detail of the fight, as though it were the only one that had ever been held in South America. Occasionally the conversation would slow down a bit, perhaps on account of the heat, but casual mention of some detail of the fight would start it all over again as though the most important part of the action had been overlooked.

This went on for an hour or so, with the train moving along at an even speed of some 30 miles an hour, but presently the puffing of the engine became labored and noisy, and we discovered that the terrain over which we were traveling had become more hilly.

Over the mixed noise of the engine and the natives, Sandy hollered to me, "You know, by the way the exhaust coughs so unevenly I can tell that one cylinder is doing more work than the other." I hollered back, "Can you tell which is the one that's working hardest?" And Sandy replied, "I may, before long."

I doubted that he could, but said nothing further and turned my attention to the landscape, which consisted of sand and hills and more sand. The hills were getting steeper and the puffing of the engine was getting louder. Suddenly the engine's cough became a racket which resembled the pounding of a sledge hammer on an anvil and the train came to sudden stop. Something had happened.

Sandy and I were first out and at the engine, where we discovered the cause of the stop—a broken side rod. The engine was of the Mogul type with three pairs of driving wheels, the middle pair being the main drive. The front section of the right hand side rod was the broken one and an examination of the broken ends showed a bad crystal formation.

At this point the conductor arrived from the other end of the train and wanted to know if someone had thrown a bomb. Upon learning the cause for the delay, he asked if the damage could be fixed, to which the engineer replied, "No, Senor, but we can take the broken pieces off and proceed."

I heard Sandy calling me from the other side of the engine, and as I walked over to join him, he said, "If they don't take the side rods off this side too, something will happen." However, we said nothing, and watched. It didn't take the Peruvians long to take the broken rod off, but since it carried the knuckle for the right hand rear section, that section had to be removed too. The sections are indicated by Nos. 1 and 3 in the drawing.

Triumphantly the engineer, fireman, and conductor looked at us and then begged us to board the train. The natives who had left the train were herded back into the coaches

by the conductor with the air of a gaucho herding cattle. The engineer blew the whistle and opened the throttle, and we were under way—but not for long. With a jerky movement the train moved about a foot and came to a dead stop. What had happened was that the left rear side rod, indicated as No. 4 in the drawing, had somehow got a wrong start. When the middle pair of wheels turned forward, the rear pair turned backward, since the one eccentric pin alone was not enough to turn the rear wheels in the right direction.

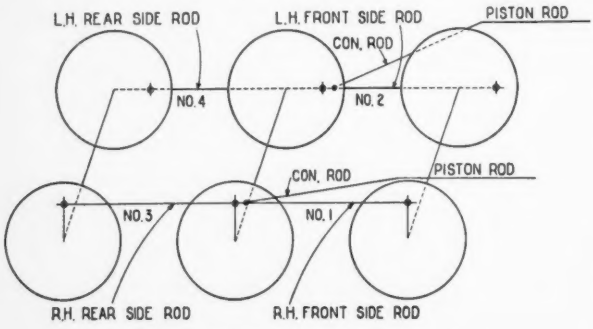

Diagram illustrating location of rods

Again the train crew got out to look the situation over, and again Sandy and I took up our observational position. The crew agreed that rod No. 4 would have to be taken off so that the rear wheels could idle, which was done. Then they looked at us again, a little less triumphantly, and assured us that the trouble was now removed and we could proceed. Sandy shook his head but said nothing.

Again we boarded the train, the conductor herded the natives back into the coaches, the engineer blew the whistle, and opened the throttle, steam poured out through the open drain cocks, and the drive wheels turned, but to no effect. The main pair of wheels was slipping lustily and the front pair now revolved in the wrong direction. The experts gathered at the engine again and proceeded to take off rod No. 2, which meant that they now had all the side rods down. Sandy said to me, "They don't know how lucky they were that either of these side rods didn't stop on dead center or they would have broken either the rods or the pins. Now, with two-thirds of their traction removed, I doubt very much if the engine can pull the train up the grade." As Sandy predicted, so it was. No matter how much sand the engineer applied, the lone pair of driving wheels could not obtain enough traction to pull the load.

The passengers could restrain themselves no longer and the crew was flooded with suggestions: "Give it more steam"—"Give it less steam"—"Let the train roll back to the bottom of the grade and then gather speed and use the momentum to get over the hill." At this point the engineer had the bright idea of having all the passengers stand, sit, and hang onto the engine to increase its weight and provide the necessary friction, but to no avail. Then the conductor developed the idea which seemed brightest of all. "Split the train in two, take half of the cars over the hill, then come back for the other half." With a dash of enthusiasm, they started to apply this solution when Sandy found it impossible to keep still any longer. "Senors," he said, "how are you going to get the engine back for the sec-

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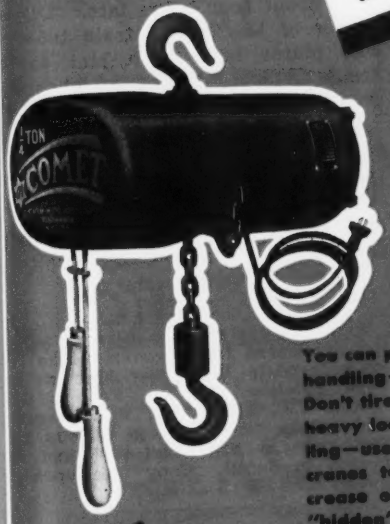

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ond half of the cars? Or is there a siding somewhere beyond the hill?"

They hadn't thought of this. The trio went into a huddle and then informed Sandy that the nearest siding either way was about 30 miles distant with plenty of hills between. "Well," said Sandy, "I hope you don't intend to take half the cars 30 miles and then return for the rest and all this with a disabled engine."

"But, Senor," said El Conductor and Maquinista in unison, "we thought that splitting the train would solve the problem."

"Well, it won't," growled Sandy, "but let me see—" he continued, thinking aloud. "How long will it be before the next train is due?"

"There won't be any train from Lima tonight, Senor," answered the conductor. "There is a freight scheduled to leave Huacho, but it will not leave until after we get there."

"Then that just suits my idea," said Sandy, turning to me and motioning me to follow him. We walked along the track for a short distance until we came to a joint in the rails. "Here," he said, pointing down at the track, "is the solution." Not catching his meaning, I looked at him blankly. Pointing again to the plates used to hold the rails together, he said, "We'll have them take some of these fish plates off, somewhere back of the train, and use them as stiffeners along the flutes of the broken rod, if we can find some way of clamping the plates to the rod."

We explained the idea to the train crew, who thought it nothing short of invention and conferred the title "Los dos mechanicos" upon us. They gave us permission to go ahead and helped us to take the plates off a joint some distance back of the train. Then we planted a red flag and a flare at the loosened joint, just in case. Luckily, the tool box of the engine contained a ratchet drill, which we used to drill two holes in each of the sections near the break in the rod. Using track bolts, we bolted the plates and pieces of the rod together. In less than two hours we had all the rods in place on the engine again. Noting that the rod was bent slightly, which prevented the bearings from being lined up, the bearings were loosened a bit but not enough to do any harm.

Again we all piled into the coaches, the engineer blew the whistle, and opened the throttle. A cheer went up as the train started and slowly gathered speed as we went over the top of the hill. We arrived at Huacho under our own power and only about four hours late. The engineer of the freight train took the fish plates back with him as the freight started back over the route we had just covered.

Sandy and I were both offered jobs in the roundhouse at seven sols a day, but we had our hearts set on ten sols a day and Talara. So we accepted the hospitality of Huacho only until we had an opportunity to continue our trek northward.

Fellows Involute Measuring Machine. An illustrated folder covering the Fellows Involute Measuring Machine has been published by the Fellows Gear Shaper Co., Springfield, Vt. Operation and set-up for checking various gear tooth shapes are illustrated and discussed in detail. Copy free upon request.

"Rivett 505" is the title of a 22-page bulletin now being distributed by Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass., covering this firm's 505 Series of plain precision bench lathes and hand screw machines. The bulletin profusely illustrates the various machines in the 505 Series as well as numerous Rivett attachments. Specifications are included.

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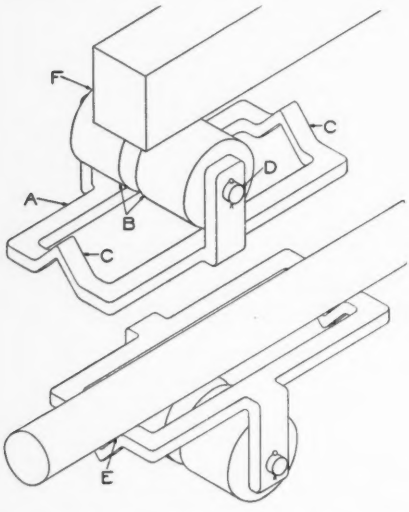
IDEAS FROM READERS

Improved "Dolly"

By CHAS. H. WILLEY

ILLUSTRATED in the drawing is a special "dolly" which can be used in the machine shop to handle heavy round or square bar or sheet stock or other materials. The device consists of the frame **A**, cut and welded from a section of machine steel, and two wide machine steel rollers **B**. The frame is shaped to provide two vees, shown at **C**, and is designed so that it can be assembled to the wide steel rollers **B** by means of an axle pin, as shown at **D**.



A dolly of the type shown here can be used to move stock or as a stationary roller.

The dolly may be used as a truck for moving heavy iron beams, bars, pipes, columns, and so on. For this type of work, the stock to be moved is simply placed on the vee grooves of the frame, as shown at **E**, and the truck is pushed or pulled by whatever means seems most convenient. The vee grooves hold the pieces from rolling or sliding off the sides of the truck.

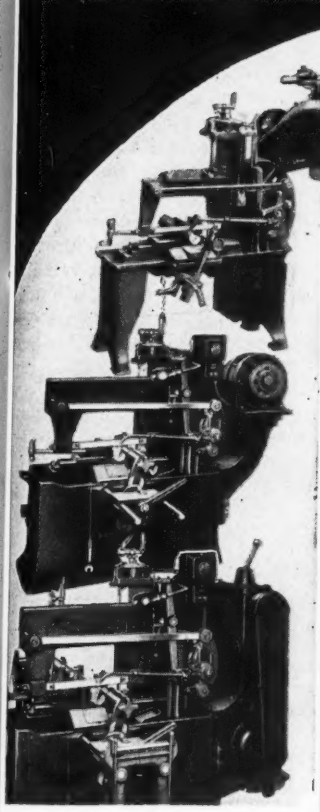
Dollies of this type will be found convenient for moving machine tools or other heavy equipment in places where an overhead crane is not available. By turning the dolly over so that the frame is flat on the floor, as shown at **F**, the dolly can be made to serve as a stationary roller.

Coining a Ball End Lever

By GEORGE TEXTER

THE illustration shows a number of levers, the ball ends of which have been cold coined by using high speed riveting hammers. The smallest ball is approximately $\frac{7}{16}$ in. in diameter and was held between split dies while the dies were rotated by the operator. The diameter of the ball was reduced approximately .003 in. in five seconds, and every trace of fin left from a previous drop forg-

MARVEL



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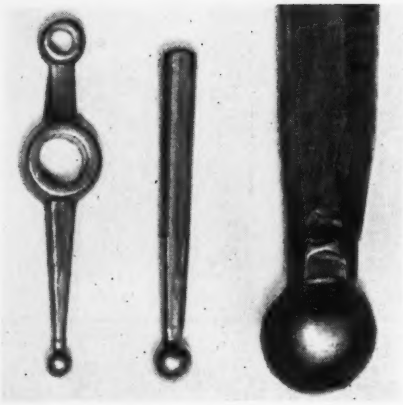

Illustration showing ball end levers which have been cold coined.

ing operation removed.

There was no difficulty in holding the ball accurately to size, since this was determined entirely by the construction of the split dies, the faces of which came together when the ball was reduced to the proper size. In addition to hardening the surface of the ball, the coining operation produced a highly polished surface.

Effective Pull and Its Meaning

By W. F. SCHAPHORST

IN the transmission of power from one pulley to another by means of a belt, the tension developed on one side of the belt is greater than that on the other. The side having the most tension is known as the tight side, while the one having the lesser tension is known as the slack side. This difference in tension of the tight and slack side of the belt is designated as the effective pull. To illustrate pull and its importance, let us refer to the drawing shown herewith.

The drawing shows a horizontal belt drive with tension or pull of 1,000 lbs. on the tight side and 200 lbs. on the slack side. By subtracting the tension on the slack side from the tension on the tight side (1,000 lbs.-200 lbs.), the effective pull of the belt is found to be 800 lbs. If the pull of the belt was 1,000 lbs. on both the tight and slack side, there would be no power transmitted due to the fact that the drive would then be in perfect balance (1,000-1,000 lbs.). With the effective pull known, the horsepower transmitted by the belt can be easily calculated by the following formula: Multiply the effective pull in pounds by the velocity of the belt in feet per minute and divide by 33,000.

When making estimates of the tension of the slack side for single ply and double ply belts, most engineers allow roughly 35 lbs. per in. of width for the former and 50 lbs. per in. of width for the latter. For the tension on the tight side of these belts,

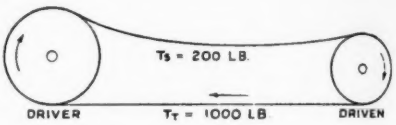

Illustration showing a belt drive having an effective pull of 800 pounds.

70 lbs. per in. of width is ordinarily allowed for the single ply belts and 110 lbs. per in. of width for the double ply belts.

Heavy-Duty Gripper

By WM. H. CHARLES

A heavy-duty gripping device which can be used for extracting heavy toggle keys is illustrated in the drawing herewith. This device can also be used for holding workpieces such as motor armatures when in-

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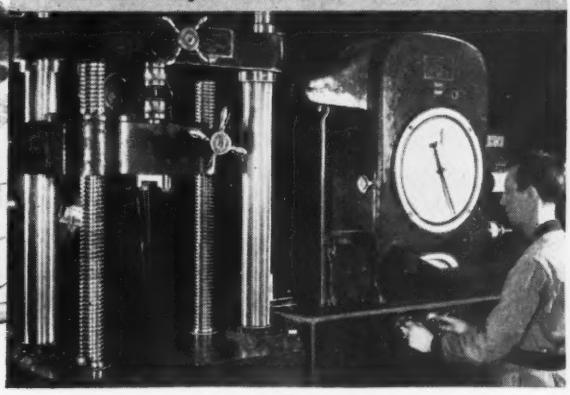

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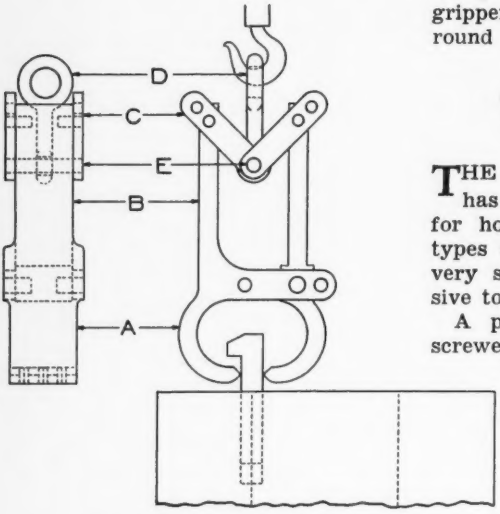
sulation is being applied to the windings.

The gripper consists primarily of the jaws **A**, the toggle levers **B**, the toggle strips **C**, and the eye connecting rod **D**. The toggle strips **C** are fastened near the ends of the levers **B** by means of swivel pins. Eye rod **D** is connected to the strips **C** by the pin **E**. All parts of the device are made from high grade steel.



Drawing of Heavy-Duty Gripper.

To use, the jaws **A** are fitted over the pin to be extracted and a hoist hook passed through the eye in the connecting rod **D** as shown. The hoist hook is then raised. As the hook is raised, the rod **D** draws the strips **C** upward, causing the toggle levers **B** to be forced apart. This action closes the jaws **A** upon the pin being extracted with a powerful grip. The hoist hook continues to be raised until the toggle pin has been extracted from its hole in the shaft. The heavy-duty gripper can be adjusted to accommodate various sizes of toggle keys. Vee notches in the jaws **A** prevent the heavy-duty gripper from slipping when handling round shafts.

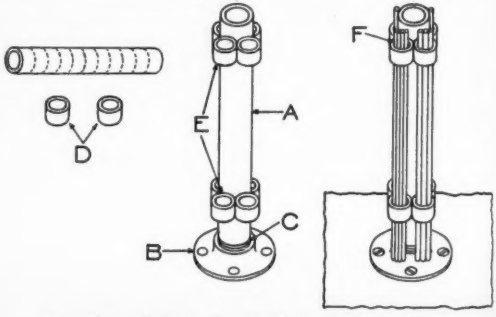
Welding Rod Rack

By A. H. Waychoff

THE drawing shows a rack which has been designed by the welder for holding and separating various types of welding rods. The rack is very simple in design and inexpensive to make.

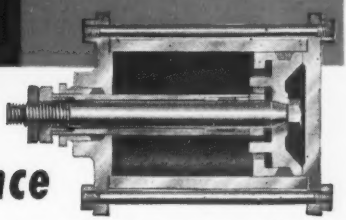
A piece of one-inch pipe, **A**, is screwed into a floor plate **B**, as shown at **C**. Following this operation, a piece of pipe approximately ¾ in. in diameter is sawed into rings as indicated at **D**. A number of these rings are now welded around the pipe **A** near the top and bottom in such a manner that each ring above is in direct line with a corresponding ring below, as illustrated at **E**. The floor plate **B** is then fastened to a bench by means of screws.

Welding rods can be slipped through the rings as shown at **F**, all rods of the same composition and size being placed in a separate com-



Drawing of Rack for Holding Welding Rods

2 Features



for high efficiency air cylinder performance

● Every Hannifin air cylinder is bored and honed, regardless of diameter or length of stroke, producing a cylinder bore that is straight, round, and smoothly finished. The exclusive Hannifin "Leak-proof" construction with soft graphite-treated piston packing, easily adjustable from outside the cylinder, gives a high efficiency piston seal that can be consistently maintained.

Perfect piston fit in a highly finished cylinder bore means minimum friction loss and greater use of air power. Friction loss tests at 10 lbs. per sq. in. m.w.p., on 4½ in. diameter cylinders, show Hannifin cylinders have less than 40% of the starting friction, and less than 30% of the moving friction of ordinary types of air cylinders.

The improved air cylinder performance resulting from this exclusive design is available for any type of application. Hannifin air cylinders are built in a complete range of standard types and mountings, sizes 1½ to 16 in. diameter, for any length stroke. Larger sizes built to order. Both single and double acting types, with or without air cushion. Write for Bulletin 34-MM with complete specifications.

HANNIFIN MANUFACTURING COMPANY

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Engineers · Designers · Manufacturers · Pneumatic and Hydraulic Production Tool Equipment

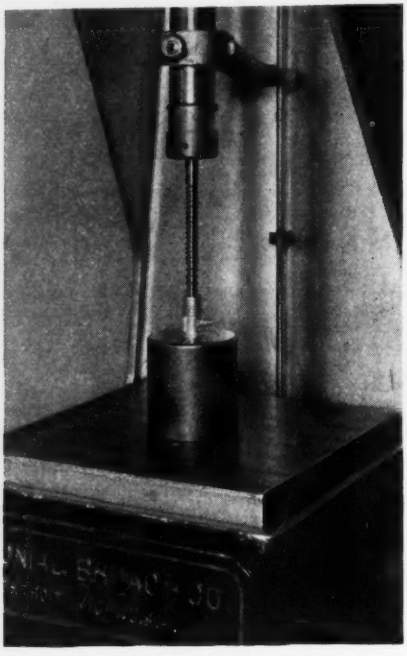
HANNIFIN

EFFICIENT AIR CYLINDERS

partment. This arrangement enables the welder to quickly select a rod of any size and composition without having to fumble through a quantity of rods in order to find the one desired. The welder can also see when he is running low on a certain type of welding rod, thus enabling him to replenish his stock before the supply has become completely exhausted.

Cylinder Bores for Model Engines Are Broached

THE production of model engines for use by builders of model airplanes has become so much of an



Broaching the Bore in an Engine Cylinder for a Model Airplane

industry, during the past year or so, that mass production methods are gradually finding their way into the manufacture of certain of the more essential parts.

The accompanying illustration shows how one Detroit manufacturer of model engines finishes his cylinder bores, the method employed being not only fast and economical, but assuring extremely fine accuracy in straightness and diameter. As shown, a broaching tool is employed, power being supplied by a Colonial Light Duty Broaching Press. The tool can be used to broach thousands of engine bores before showing signs of wear.

The fixture is of simple design, consisting principally of a guide for the lower end of the broaching tool. No clamping is necessary, as the downward thrust of the tool holds the work in position.

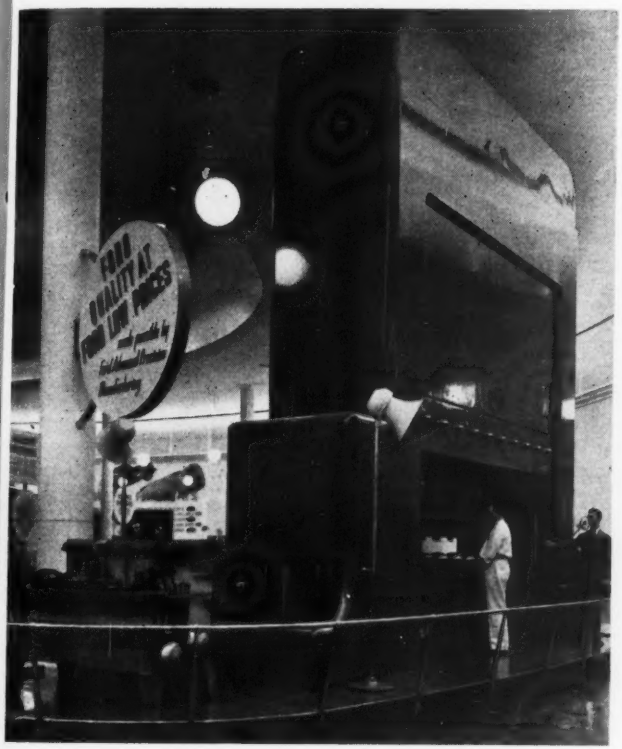
Heald No. 42 Multi-Duty Bore-Matic. A heavy-duty precision boring machine, designated as the Heald No. 42 Multi-Duty Bore-Matic, for use in performing multiple or progressive operations including boring, turning, plunge grooving, plunge and generated facing, is described and illustrated in a six-page bulletin now being issued by The Heald Machine Co., Worcester, Massachusetts.

Included in the bulletin are illustrations showing various workpieces that have been finished on the Heald Bore-Matic. Copy of Bulletin 4049 will be sent free upon request.

"Gear Cutting Tools" is the title of a 32-page booklet now being published by Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. Contained in the booklet is information on selecting and sharpening hobs, estimating roughing time, and spline shaft hobbing. Tables of cutting speeds together with illustrations and specifications of standard and special hobs are given. The booklet also includes tabular information and formulas for calculating gear tooth proportions as well as data on shaper cutters, burnishers, master gears, and involute cutters. Copy free upon request.

A Lesson in Industrial Emancipation

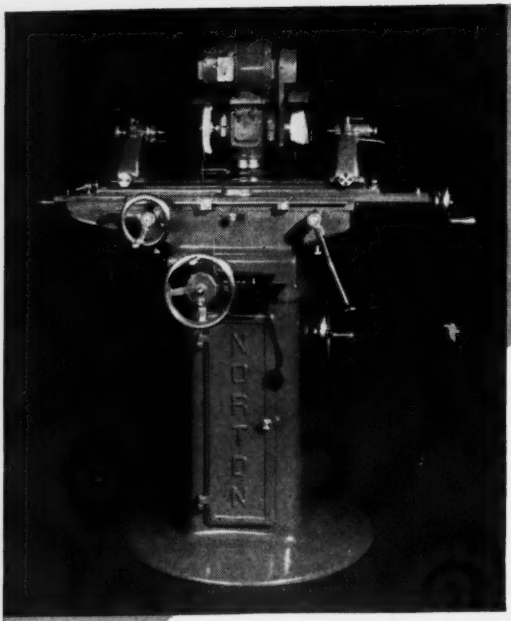
VISITORS at the Ford Exposition at the New York World's Fair will see a giant 160-ton press producing inner shells for automobile hub caps at a cost of 12 and a fraction cents each while beside the machine a skilled workman will produce the same parts, working by hand, at a cost of at least $2.50. As the visitors watch the workman pounding away at the sheet metal with a variety of hammers and mallets, forming the parts over wooden forming blocks, they will undoubtedly be able to understand why a modern Ford V-8 would cost $17,850 if it were all made by hand. The press produces 2,160 shells in the same length of time required by the hand workman to produce one.



From this press, in operation at the Ford Exposition at the New York World's Fair, visitors may learn why the automobile is available to the average man, instead of only to the very wealthy.

Operation of the massive press will provide a graphic demonstration of how quantity production of automobile parts, made possible through the development of the modern machine tool, has lowered the price of automobiles and thus expanded the market, creating thousands of jobs in the motor car industry and many thousands more in related industries.

The press is the same type of machine used in the Ford Rouge plant. The cold rolled steel stock will be fed to the machine by an automatic conveyor and ten operations will be performed in the production of the completed piece. The press, which extends 28 feet above the floor and 5 feet below, rests on a concrete foundation supported by wood piling driven 75 feet into the ground.



NORTON

THE Norton Multipurpose G...hydraul... wheel feed. Does external ...lindrica... bination live spindle and dead ...ersal he... set at any desired angle, flood ...spindle ... lubricated table ways. A univ... which ... success and proven to be imm...r. Buil... swings and in 36", 48" and 72" ...

The No. 1 Universal Tool and Cutter Grinder. Available with left hand footstock and clearance setting dial as shown or with universal work head. A very handy all-purpose machine for any tool room.

M-400

HINES

in the
OOL ROOM

pose G hydraulic table traverse and
xternal cylindrical grinding. Has com-
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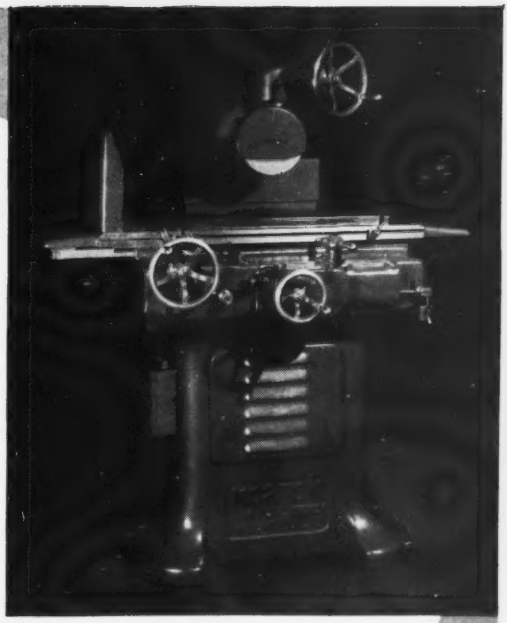
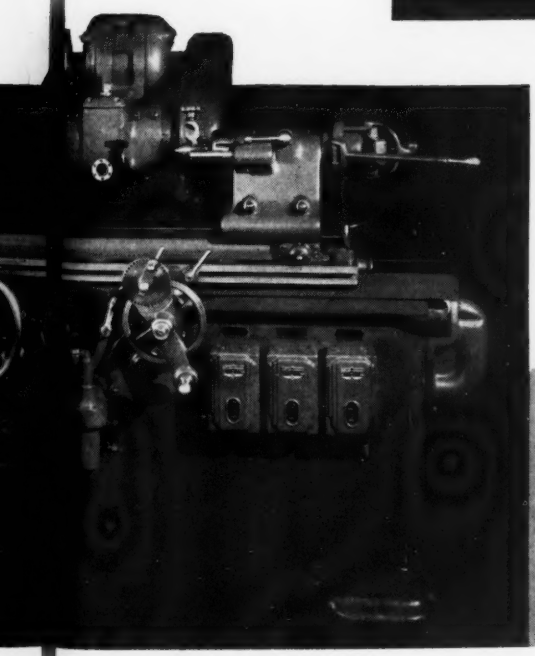
e, flood spindle bearings and pressure
A univ which has met with unusual
be imm r. Built in 12", 14" and 16"
and 72"





The 6x18" Surface Grinder with hydraulic table traverse and cross-feed as shown, or with hand feeds only if desired. An efficient performer for both tool room and light production jobs.

NORTON COMPANY
Worcester, Mass.

New York Chicago Detroit
Cleveland Hartford
London

INVESTMENT in capital goods such as housing and industrial plant equipment having failed to revive business on a scale sufficiently broad to provide jobs for large numbers of unemployed, the Government is working out a new program which will be directed toward the small competitive manufacturer, distributor, and retailer.

Intended to aid only small business, the Mead Bill authorizes the RFC to insure loans made by banks to business men for the purpose of enabling small enterprises to increase their production, extend their operations, and modernize their plants. The bill will permit no loan in excess of $200,000, require that the principal and interest be amortized over a period not to exceed seven years, limit the amount of interest and charges to 5 per cent per annum, and require that the loan be secured by a first mortgage upon real estate or a chattel mortgage, either of which must be valued at 125 per cent of the principal of the loan. Action on this bill is possible before the end of the present session of Congress.

THE article on "Brazil" in the February issue of this magazine drew a number of inquiries for further information, from which it is evident that many American manufacturers are considering the possibilities for business south of the Equator. But we will have to do more than just "consider" if we are going to develop any real markets in South America.

American businessmen pride themselves on their aggressiveness, but our collective aggressiveness in South America is nothing to boast of. American automobile sales in Argentina have been slashed to one-third, while Germany's sales have jumped 1,000 per cent. The Germans predict that they will pass our trade volume in Argentina this year and so usurp American leadership in all of the major South American countries.

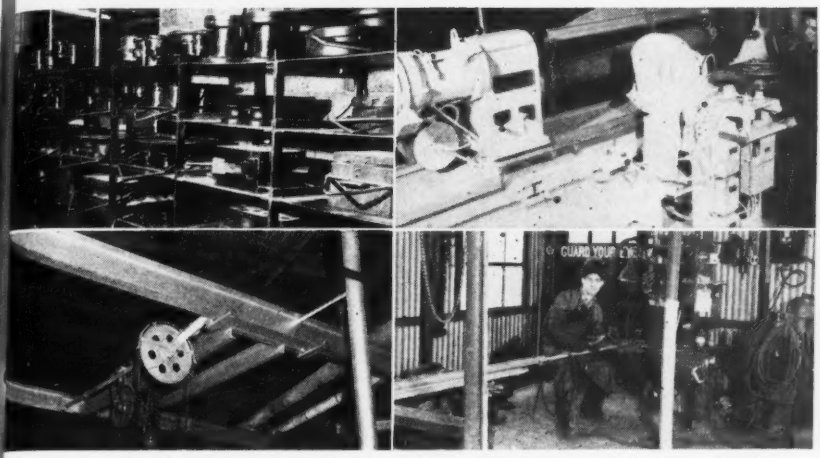
It is true that American business is up against a tough proposition in the principal South American countries, but it is also true that we have something more at stake than immediate profits. Chile has 95 per cent of the world's nitrates—a first essential for the sinews of war. Chile also has the Straits of Magellan, which would be immeasurably important if the Panama Canal were blocked in time of war. Another interesting point regarding Chile is that Americans have invested, to date, some $483,000,000 in Chilean enterprises—a bigger stake than we have in Japan, China, and the Philippines together.

The European dictators are making a carefully planned, determined, and aggressive drive to establish their "sphere of influence" in South American countries, with the idea of opening new markets for their wares and establishing bonds which will tend, eventually, to eliminate the United States from any consideration south of the Equator. This will be not only good business; it will enable them to dominate the policies of our South American neighbors, provide opportunities for expansion, and ensure friendly co-operation in case of war.

Some day we're going to say "This could have been prevented." The time to prevent it is NOW.

Racks are fabricated and rubber molds are repaired by Lincoln Welding.

Special roll grinder built in shop with Lincoln Welder.



Hoists and runways throughout plant are Lincoln Welded.

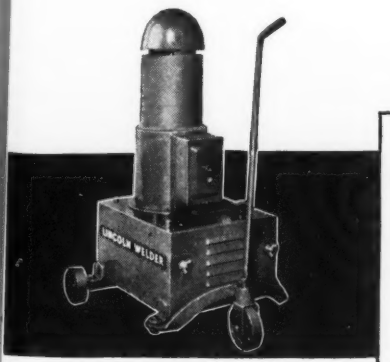
Welding shop. Structure was built with Lincoln Welder.

LINCOLN WELDER saves thousands of dollars

The machine shop of the Castle Rub- er Co., East Butler, Pa., has used a incoln Welder almost continuously for re years—building special manufactur- g equipment and repairing broken and orn parts. A few of the hundreds of pplications are illustrated above.

Mr. Russel J. Turner, President, says, "Our Lincoln Welder has saved us thousands of dollars in maintenance costs to say nothing of the indirect savings due to the forestalling of production delays. It is the most valuable piece of equipment we own."

Investigate the New Lincoln Machine Shop Welder. Equipped with Self-Indicating "Job Selector" and Current Control, it provides any TYPE of arc and any AMPERAGE for top quality and speed on every job. Consult the nearest Lincoln office or mail the coupon for details.



THE LINCOLN ELECTRIC CO.
Dept. E-609, Cleveland, Ohio

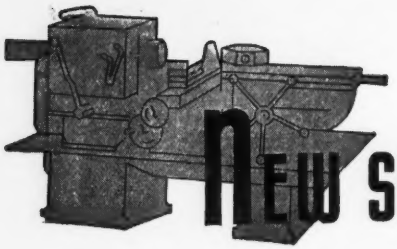
Send details on New Lincoln Machine Shop Welder (Bul. 314-A).

Name _____ Position _____

Company _____

Address _____

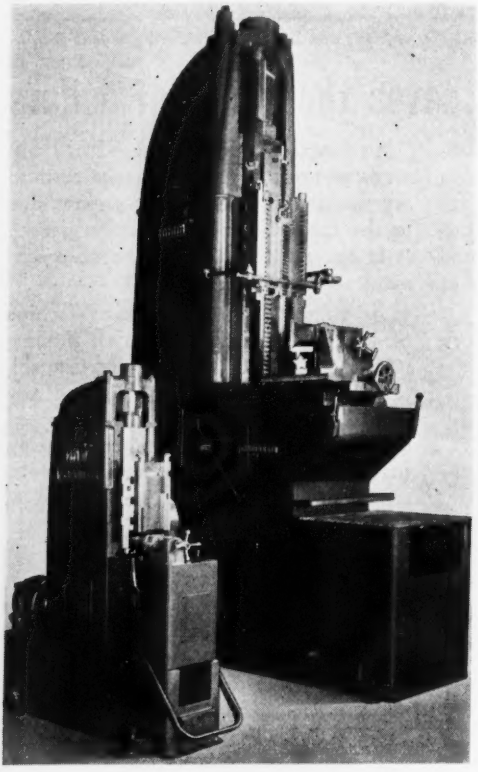
City _____ State _____



NEW SHOP EQUIPMENT

Cincinnati Single Ram Vertical Hydro-Broach Machine

The line of surface broaching equipment built by The Cincinnati Milling Machine Company, Cincinnati, Ohio, has been augmented by the addition of a new line of Single Ram Vertical Hydro-Broach Machines. Built in 12 standard sizes, from the No. 1-18 with an 18-in. ram stroke and 2,000 lbs. normal broaching force to the No. 15-60 with a 60-in. ram stroke and 30,000 lbs. broaching force, the Single Ram Hydro-Broach Machine is obtainable in both the fixed and the receding table types. The machine is available in special sizes.



The standard fixed table machine is built for single cycle operation and the ram stops at the end of each stroke. Completed work is removed at the end of the cutting stroke and new work is placed in the fixture while the ram is stopped at the top of its return stroke.

Either full automatic or single cycle operation may be arranged with the receding table type machine. Work is loaded, in the full automatic cycle, as the ram returns to the starting position following the completion of the cutting stroke. The table advances to the broaching position, the ram makes a cutting stroke, the table recedes and the cycle repeats itself. For single cycle operation, the ram is stopped at the top of the return stroke and the operator unloads and loads the work.

Both types of machines, regardless of the operating cycle, may be stopped instantly by shifting the hand levers at each side of the operating station or by stepping on the foot treadle. Instant reversal by means of the dual hand levers is also provided.

The comfort and safety of the operator have been carefully considered in the design of the operating platform. The

Cincinnati Single Ram Vertical Hydro-Broach Machines

ee type construction provides plen- of foot room and the foot treadle instant stops extends the full width the machine. In the single cycle achines, two levers, which require multaneous use of the operator's nds, prevent starting the machine un- the hands are removed from the rkpiece or cutting area.

Hardened and ground automatically- bricated ways for the ram are re- ovable. Broach holders are inter- hangeable and are amped against solid ovetail locating sides the ram. On the re- ding table type ma- hine, hardened and round automatically- bricated table ways provided. These ays, like those of the m, are replaceable ould wear occur. In- erchangeable fixtures n be used and are amped to a dovetail cating side of the ta- e. Drilling and tapping e avoided.

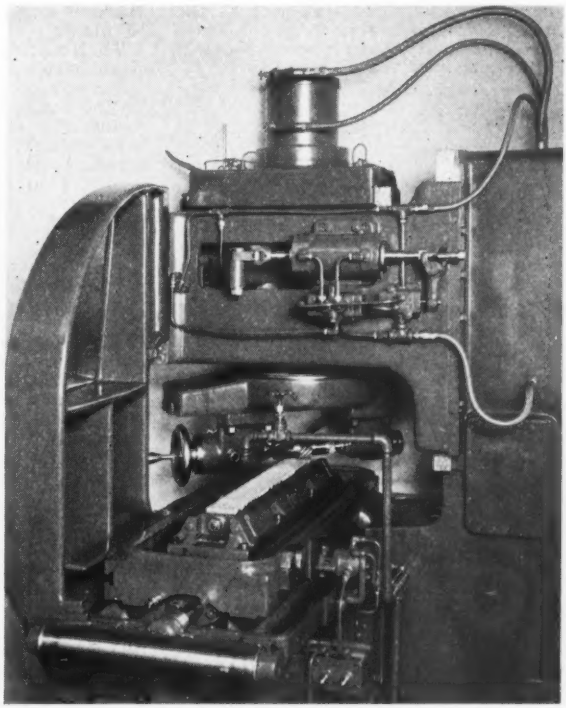
Constant displacement ydraulic pumps, direct nnected to a conveni- tly located motor, ower the units and all echanism is simple in sign for trouble-free rvice. A large radiat- g area in the hydraulic mpartment facilitates l cooling and prevents istortion from over- eating.

An exclusive latch de- ice returns the table to oaching position with- 0.0003 in. on both full utomatic and single cy- le operation of the re- ding table type broach.

All motors are mount- on the exterior r ready access and easy mainte- nance. The hydraulic drive motor, anging from 3 h.p. for the No. 1-18 Vertical Hydro-Broach to 30 h.p. on he No. 15-60 is direct connected to the ydraulic unit. A speed control valve or the ram, furnished at extra cost, an be built into the broaches at the actory. Standard ram speeds start at 1 ft. per minute forward and 81 ft. er minute return on all broaches with 2,000 lbs. force and decrease to 26 ft. per minute forward and 51 ft. per minute return on broaches having 30,000 lbs. force.

Michigan Improved Rack-Type Gear Finisher

Improvements in design of the Michigan Rack-Type Gear Finisher have been announced by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. In addition to having a heavier and more rigid head construction, the improved finisher incorporates a number of operating improvements. Included is a hydraulic mechanism which oscillates the gear-carrying arbor and moves the gear back and forth across the rack while the rack moves back and forth endwise. In this manner, wear is evenly distributed over the rack. The hydraulic mechanism is in-



Michigan Improved Rack-Type Gear Finisher

terlocked with the machine controls, consequently starting and stopping with the machine. The length of the oscillating stroke and speed of oscillation is adjustable.

The more rigid design of the improved finisher is said to increase cutting speed while further contributing to gear accuracy. The method of supporting the head slides and work arbor has been changed to provide better balance of the slides over the center of the gear and thus eliminate overhang of the work with respect to the slides. To simplify lubrication of slides and bearings, a one-shot system of lubrication is used in the finisher.

Barnes "Largest" Internal Honing Machine

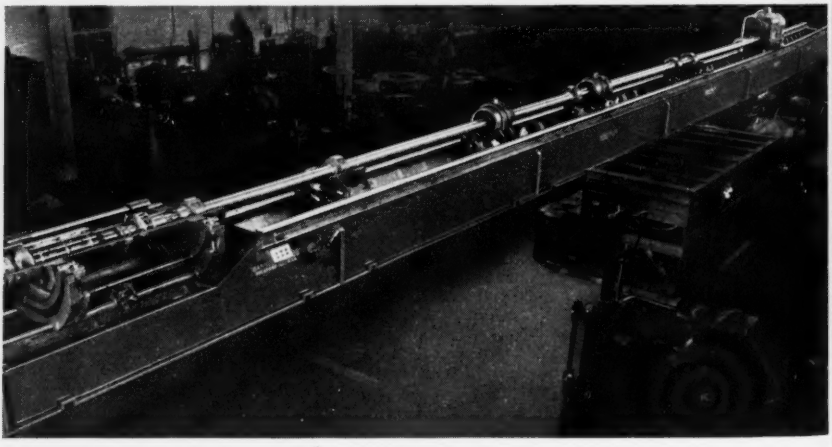
The "business" end of the largest internal honing machine in the world—recent product of the Barnes Drill Company, Rockford, Ill.—is shown in the illustration. This machine is a new embodiment of many original ideas, designs, and combinations of elements developed by the Barnes Drill Company in connection with the development of both horizontal and vertical hydraulic honing machines.

The machine, assembled with its work support bed, has a total overall length of 184 ft. 2 in. The operating portion of the machine is 92 ft. long and weighs 91,130 lbs. The machine is constructed principally of fabricated steel carefully machined and carrying accurately aligned ways. Mounted in anti-friction bearings on the ways are the intermediate supports for the long hone driveshaft and the traveling head which has a powerful electric motor that rotates the hone and its shaft through pick-off gears. Hydraulic reciprocation of the hone, driveshaft, supports, and head is effected by means of a fluid motor installation at the far end of the machine. The working stroke of the hone is 76 ft., and diameters can be honed up to 30 inches.

The machine is controlled from a push button station and single lever at the operator's position near the middle of the machine. The hone can be hydraulically expanded until the positive stop or final size is reached and short stroking can be used at any point desired. The bed of the machine contains tanks for hydraulic oil, a filtering system, and large reservoirs for coolant.

Sheffield Thread Lead Testing Machine

The Sheffield Gage Corporation, Dayton, Ohio, is now offering to the trade a Sheffield Lead Testing Machine incorporating the exclusive feature—the Sheffield Frictionless Reed Mechanism. Comparing the lead interval of screw and worm threads against a precision or master block setting, the Standard



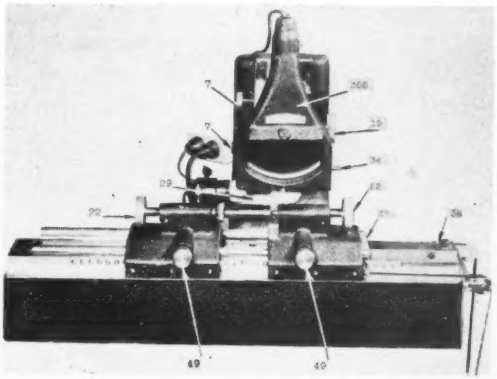
Barnes "Largest" Internal Honing Machine

odel No. 30 provides a simple, fast, d absolutely accurate instrument for is important inspection operation. The o. 30 will accept 10 in. between cen-rs, and 5 in. of thread up to 6 in. diameter. The standard No. 40 and her special models are available for nger screws on applications such as achine tool lead screws, and so on. he integral base and column casting is refully laid out to ensure more than dequate weight with proper ribbing to rovide extreme stiffness.

The patented Sheffield Visual age Head, incorporating a rictionless reed pivot with the heffield Reed Mechanism, is ounted on a bracket by four orizontal metal reeds to allow he contact point to be lowered nto and raised out of the crew thread being lead-tested. his short vertical clearance ravel is secured through a nvenient hand knob. Com-lete vertical positioning to ac-ommodate any diameter crews within instrument ca-acity is controlled by a con-enient hand knob operating a ertical screw and nut. In the hread lead tests the displace-ent of the contact point on he gaging head is in a hori-ontal plane and the Sheffield eed Pivot is used to transmit his displacement through 90 eg. to the 2,000 to 1 Visual Gage ead.

The work-carrying centers ride on recision balls in vee grooves, ensuring mooth, true travel throughout the ength of the bed. After placing the art between centers, both centers are ocked with respect to each other so hat they become, in effect, a single lide to be handled during the gaging peration.

To operate the gage, the workpiece s placed between centers with the hreaded end of the piece toward the ight hand, if the entire piece is not hreaded. The center blocks are locked ogether by turning the knurled knob Det. 49). Precision gage blocks are hen placed between the precision block ontact pad on the slide (Det. 37) and he precision block contact on the base Det. 38) so that the right end of the hreaded portion is under the contact oint (Det. 29) in the gaging head (Det. 02). To secure the approximate ver-ical positioning, the bracket is raised r lowered by means of the hand knob (Det. 34) and locked in place with knurled knobs (Det. 7). The gaging head is lowered into the thread by means of the hand knob (Det. 19). By turning the piece to be gaged, the shadow can be quickly and precisely brought to zero on the scale. The gaging head is then raised out of the thread by using the knob (Det. 19). The precision blocks are removed to allow the slide to move to the right through the proper predetermined distance. The gage head is then lowered into the



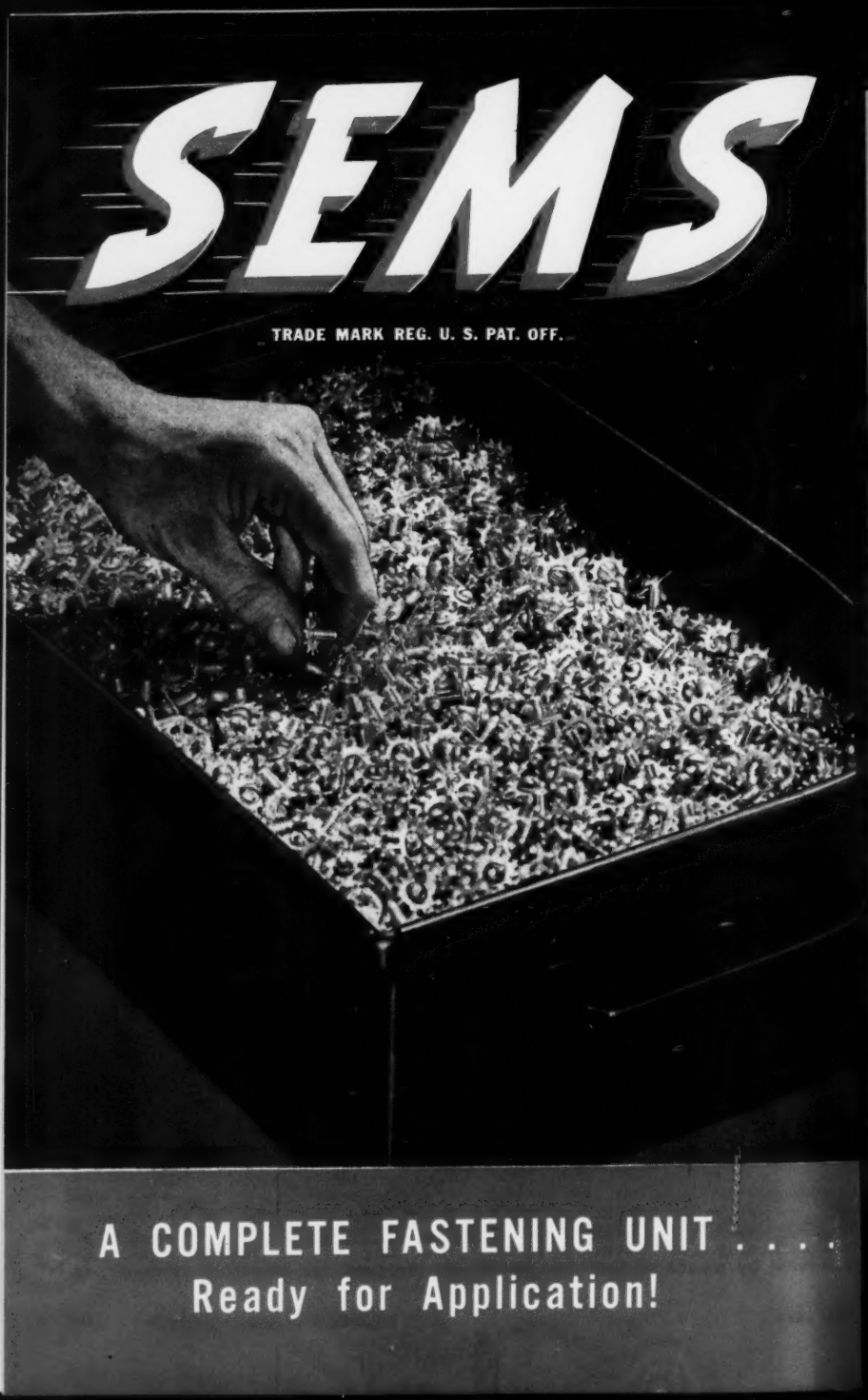
Sheffield Thread Lead Testing Machine

thread at this new point and the accuracy of the lead can be read directly on the scale.

By this method of comparison against primary gaging standards such as precision blocks, all possible errors inherent in lead screw or geared instruments are said to be avoided and a positive and accurate means of lead measurement is provided. Because of its principle of operation, the preciseness and service life of the instrument is said to be practically indefinite.

Acme 2-In. 8-Spindle Coupling Tapper

Leadscrews having nuts that automatically open after couplings have been completely tapped is the feature of a 2-in. 8-spindle coupling tapper now being built by The Acme Machinery Co., 4537 St. Clair Ave., Cleveland, Ohio. According to the manufacturer, this feature ensures a perfect thread and


SEMS
TRADE MARK REG. U. S. PAT. OFF.
A COMPLETE FASTENING UNIT . . . .
Ready for Application!

Pre-Assembled SHAKEPROOF Lock Washer and Screw

* SEMS is the registered trademark of Illinois Tool Works, manufacturers of Shakeproof Lock Washers. Only genuine Shakeproof Lock Washers are used in the manufacture of SEMS.

Save Time . . . Save Labor . . . Save Money

Save with SEMS—the proven Shakeproof fastening unit that immediately cuts production costs! SEMS bring you, in a single fastening unit, both lock washer and screw—preassembled and ready for application. SEMS save the time and trouble of putting lock washers on screws and stop the costly waste of dropped and wasted lock washers. SEMS make ordering easy by supplying both products as one unit, and keep inventories of both screws and lock washers automatically in balance. SEMS assure lowered labor costs and overhead charges because their use speeds up assembly—they aid control of product quality because each screw is provided with the correct size and type of lock washer—and no screw can be driven without a Shakeproof Triple-Action Lock Washer to protect it from vibration.

also available with PHILLIPS Recessed Heads

WRITE FOR TESTING SAMPLES

Try SEMS fastening units on your assembly job! A test run will convince you that SEMS offer a simple, yet practical way to cut costs—speed up production—improve performance! Free stock samples will be sent on request.

FREE SAMPLES!

LOOK AT THESE IMPORTANT BENEFITS

Lock Washer & Screw, pre-assembled and delivered as one unit.

Saves time and labor of putting lock washers on screws.

The correct size and type of Lock Washer for each size and type of screw.

No screw can be applied without Lock Washer to protect against vibration.

SHAKEPROOF LOCK WASHER CO.

Distributor of Shakeproof Products Manufactured by Illinois Tool Works

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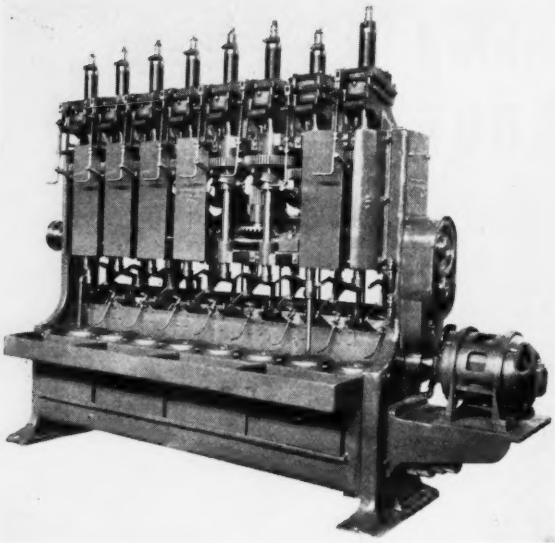
Lock Washers . . . Thread-Cutting Screws . . . Self-Locking Set Screws

Locking and Plain Terminals . . . Spring Washers . . . Special Stampings



Acme 2-In. 8-Spindle Coupling Tapper

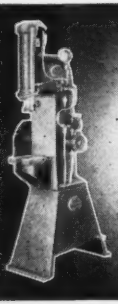
gives a positive lead to the tap as it enters the coupling. In addition, the design of the tapper includes chucks which are automatically valved by downward spindle movement.

In operation, a coupling is placed in the chuck and the tap is lowered to the work, locking the leadscrew nut. As the tap is lowered, air is automatically valved, causing the chuck to close on the coupling. Action of the leadscrew then causes the tap to progress through the coupling at the correct pitch of the thread being cut. As soon as the last thread of the tap leaves the coupling, the continued downward movement of the spindle again valves the air, causing the chuck to open. Following this operation, the nut of the leadscrew is automatically opened, allowing the counter-balanced spindle to return to its upward position with the tapped coupling on the tap shank. When the tap shank becomes filled with couplings, the couplings are emptied into a chute conveniently located at the side of and at the rear of each spindle. An Acme quick-acting ring socket permits the operator to unload while the spindle is rotating.

Speed changes of the spindle are obtained by use of pick-off gears, and the machine can be changed over to tap various sizes of couplings. When a taper coupling is to be tapped, the machine is equipped with air-operated cross-type roll-over chucks, and collapsible taps are used. When so equipped, the machine will also straight tap couplings, the roll-over feature of the chuck being locked to prevent rotation.

South Bend 14½-In. Lathe

In announcing a line of 14½-in. swing lathes, the South Bend Lathe Works, South Bend, Ind., makes available a modern lathe having especially designed attachments which adapt it for dupli-



BROACH and ASSEMBLE

At left: Self-contained 4-ton Greenerd Hydraulic Arbor Press adaptable for assembling, broaching, burnishing, etc. Adjustable ram stroke from ½" to 16".

At right: 12-ton Bench Press.

We also make 65 styles of Rack and Pinion Presses. Hydraulic Presses from 1½ to 15 tons capacity. Write for details.

GREENERD ARBOR PRESS CO., INC.

43 CROWN ST. • NASHUA, N. H.

THE FEWER, THE BETTER

The demand of the times for more production per dollar, without sacrifice in quality, brings into sharper and sharper focus the necessity for the use of the most modern materials. It is natural that the more different steels specified in machine construction, the greater the fabrication and stock room complications.

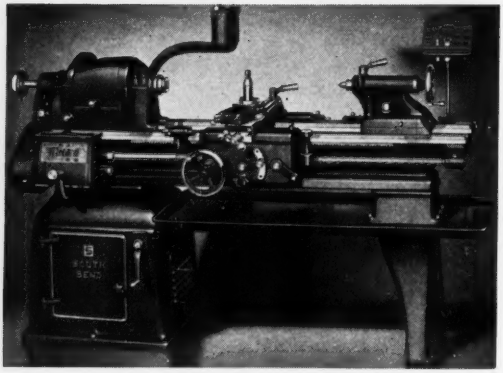
To reduce these complications, many manufacturers are taking advantage of the versatility of Molybdenum Steels. One, a builder of a varied line of heavy duty machines, replaced four different alloy steels with Chromium-Molybdenum Steel (SAE 4140) for everything from heavy crank shafts to small screw machine parts.

Overhauling your own material specifications may disclose similar opportunities for highly profitable standardization on a versatile Molybdenum steel. To assist you we will gladly send our technical book "Molybdenum in Steel", free upon request.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY



South Bend 14½-In. Lathe

cate manufacturing operations, for fine tool and gage work, and for a variety of different jobs. Features and construction of the lathe are engineered to provide smooth, silent operation, lasting accuracy, and ease of control.

The lathe is manufactured in motor drive and countershaft drive, in bed lengths of 5, 6, 7, 8 and 10 ft. with distances between centers of 24½, 36½, 38½, 60½, and 84½ in., in quick change gear and standard change gear types.

The lathe has an alloy steel headstock spindle, carburized, hardened and ground, with phosphor bronze bearings; a double wall apron with self-oiling steel gears, and multiple disc friction clutch for operating automatic cross feeds and automatic longitudinal feeds; an improved saddle and compound rest with both base and top of compound rest having adjustable tapered gibs; heavily constructed lathe bed with large box braces, and built of a special grade of iron with 70 per cent steel to make a hard, close-grain casting and with three large hand-scraped V-ways and one flat way on the bed to accurately align headstock, carriage and tailstock.

Specifications include a swing over the saddle of 10¼ in.; thread cutting range on the quick change gear model of 4 to 224 screw threads per inch, standard change gear model of 4 to 160 screw threads per inch; 32 right or

BERGRAM Utility Grinders

"Grinders With Many Uses"

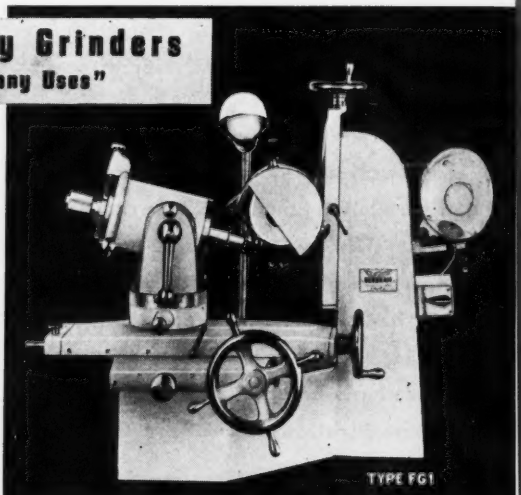
Accurately Grind:

1. End Mills
2. Small Cutters
3. Straight or Tapered Reamers
4. Tap—lands and flutes
5. Formed Tools

A Few Features:

1. Easy Setup without Wrenches
2. Work ground from Shank or on Centers
3. Sensitive grinding — Ball Bearing work Spindle

WRITE FOR ILLUSTRATED FOLDER



BERGRAM MECHANICAL ENGINEERING CO., INC.

18 HARTFORD AVE. • NEW BRITAIN, CONN.

Where Do You Buy Your DAVIS Boring Tool CUTTERS?

If you need a pair of Davis Cutters, made of some special metal, such as Stellite, Tungsten Carbide, etc., it isn't necessary that you order direct from the manufacturer of that metal.

As the manufacturer will conscientiously tell you himself, the best place to buy cutters for Davis Boring Tools is from the Davis Boring Tool Company. You'll get them just as cheap — you'll get them correctly ground — and most important of all, you'll be sure of a perfect fit.

Stellite cutters, as well as Tungsten Carbide Tipped Cutters, in the more popular sizes are carried in stock for immediate shipment. Write us today.

DAVIS BORING TOOLS

DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY, Inc.
ST. LOUIS, U. S. A.

left hand longitudinal feeds obtained in the quick change gear model from 0.0015 to 0.021 in., and in the standard change gear model, 0.002 to 0.021 in.; cross feeds in the quick change gear lathe of 0.0006 to 0.0078 in., and in the standard change gear lathe, 0.0008 to 0.0078 in. The hole through the headstock spindle is 1⅛ in. with collet capacity of ¾ in.; spindle speeds are 22, 37, 59, 99, 149, 247, 396, and 647 r.p.m.; cross slide of the compound rest is 10 in. Metric lead screw and metric graduations are available.

Attachments for manufacturing operations include hand lever type draw-in collet chuck, hand lever tailstock, hand lever double tool slide, oil pan, pump and piping, turret attachment and four-way tool post. Tool room attachments include handwheel type draw-in collet chuck, telescopic taper attachment, micrometer carriage stop, thread dial indicator, chip pan, electric grinding attachment, and milling attachment.

Colonial "Junior" Broaching Press

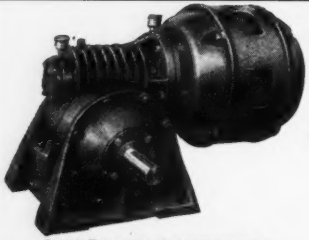
To meet the demand for a low-cost hydraulic press both for broaching parts and for miscellaneous light assembly work, the Colonial Broach Co., 145 Jos. Campau St., Detroit, Mich., has brought out a "Junior" broaching press. This press is similar to the larger standard lines of Colonial broaching machines in virtually every detail except size.

Measuring only 31 in. in height, the Junior has a capacity rating of ½ ton and a stroke adjustable up to 10 in. The press is so designed that it can be mounted on standard benches having a base area of only 12 x 22 in., and can also be mounted directly as an accessory on machine tools such as

Colonial "Junior" Broaching Press

lathes for pressing on and removing parts from arbors. Vertical mounting of the 1 h.p. motor within the machine provides the Junior with clean, streamlined appearance and is of further advantage in locating the press in limited space.

Features of the Junior Broaching Press include a built-in tank with sight gage and 1,000-lb. pressure hydraulic pump having sight gage for reservoir



Janette Speed Reducers

37 SIZES FROM 1/50 TO 7½ H.P.

The diversity of the Janette line of speed reducers enables us to supply a machine for almost any purpose. You can select the style of compact, rugged reducer to meet your individual requirements.

Bulletins and recommendations on request.

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

ALSO ROTARY CONVERTERS—
BLOWER WHEELS—MOTOR GENERATORS

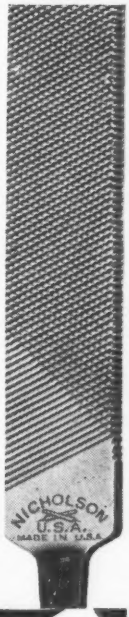
len Who Use Files Command High Pay

Only NICHOLSON FILES
ave Controlled Serrations*....

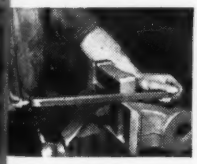
agnified photographs of the oth construction of Nicholson iles show that the tooth points e sub-divided into extra chisel- e cutting edges — from one to ree on each tooth. These extra tting edges remove metal faster an the teeth of ordinary files. hey hold the file closer to the e of work.

"Controlled Serrations*" mean longer life, too. When ordinary file teeth are worn out, reserve cutting edges of Nicholson Files are just beginning their work; ready for hundreds of additional strokes. Your distributor will supply you. Nicholson File Co., Providence, R. I., U. S. A. Canadian Plant, Port Hope, Ontario.

*PATENTED

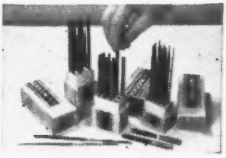


THER NICHOLSON FILES WITH EXCLUSIVE ADVANTAGES



Foundry File
Has low, rugged teeth that withstand hard usage; resist shelling off or breaking out. Ideal for severe service such as removing fins and sprues from rough castings.

Long Angle Lathe File
A free-cutting, self-clearing file ideal for lathe work or for bench filing when finishing aluminum, bronze, brass, and many other metals. The long angle at which the teeth are cut clears them quickly and leaves a smooth finish.



Nicholson X.F. Swiss Pattern Files
For tool and die making, for jewelry manufacturing and similar work requiring fine-cut files made to exact dimensions. Made in many shapes and numbers of cut.

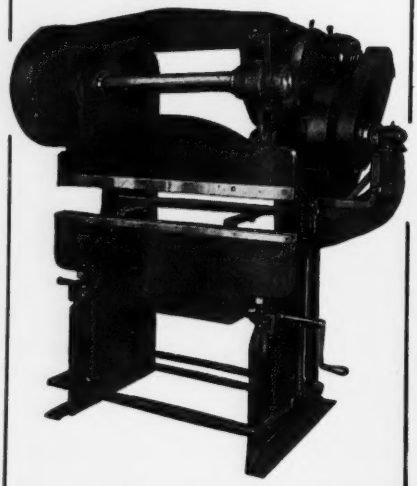
A FILE FOR EVERY PURPOSE

NICHOLSON FILES
PIONEERS IN QUALITY PRODUCTION

75th ANNIVERSARY YEAR

CHICAGO STEEL PRESS

No. 253



does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

Write for Circular No. 253

DREIS & KRUMP MFG. Company

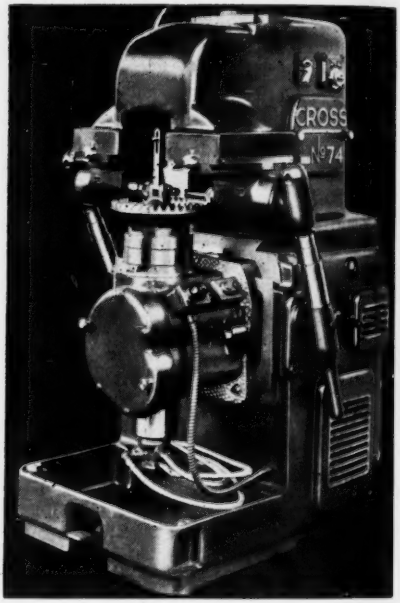
7418 LOOMIS BLVD.

CHICAGO ILLINOIS

completely enclosed 1,200 r.p.m. direct drive motor, standard Colonial power-cylinder construction and single hand-lever operating control, adjustable stroke, 5-in. clearance between ram and machine frame, and 8 x 12-in. platen. Shipping weight, approximately 750 lbs.

Cross No. 74 Universal Gear Burring Machine

The No. 74 Gear Burring Machine now being built by Cross Gear & Machine Company, 3250 Bellevue Ave., Detroit, Mich., is a universal machine de-



Cross No. 74 Universal Gear Burring Machine

signed for burring and chamfering straight bevel, spiral bevel, and hypoid gears. Burrs are removed by the use of fly cutters of special design which produce the desired chamfer on both the inside and outside ends (heel and toe) of the teeth simultaneously.

The average set-up is completed in 15 minutes or less and indexing variations are obtained with standard indexing change gears. Operation is completely automatic with self-stopping at loading position. The machine will take

Everlock washers will give your assemblies the maximum of protection at all times. • The patented tooth construction of an Everlock washer embodies powerful spring tension plus positive locking. That is the secret of their amazing performance! • Where other washers have been tried *now Everlocks are specified.*

Everlock

PAT. NO. 1776705

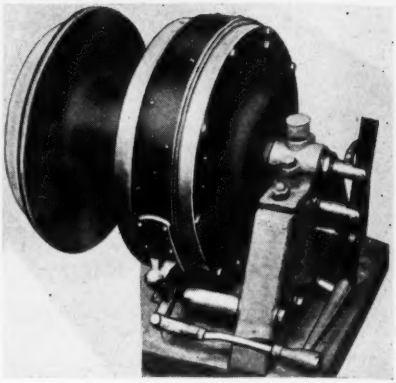
THOMPSON-BREMER & CO., 1640 West Hubbard Street, Chicago

gears of maximum outside diameter of 18 in., minimum inside diameter of 3½ in., maximum thickness of 7 in., and from 10 to 80 teeth, or more by the use of fine pitch change gears. Standard equipment includes hydraulic feed and rapid traverse, work clamping cylinder and control valve, full calibration, and Cross Auto-Stop electric timing control.

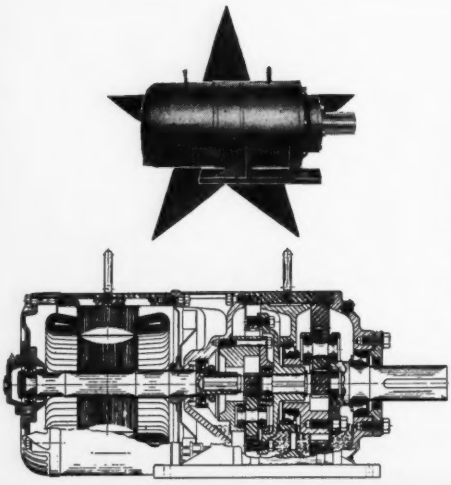
Fray-Mershon Hydraulically-Operated "Hydra-Clutch"

A hydraulically operated clutch to be known as the "Hydra-Clutch" has been placed on the market by Fray-Mershon, Inc., Glendale, Cal. Instantaneous response to control makes the clutch particularly adaptable for power-take-off units used for bull-dozing and carry-all work.

The machine contains no clutch plates, lining or throw bearing, and is self-energizing; that is, the greater the load, the tighter the clutch is said to hold. It will operate in a vertical or horizontal position. Operation depends entirely on oil, and is said to be unaffected by climatic conditions or by variation in viscosity of oils. Entirely enclosed, the clutch is water-proof and dust-proof. It has finger-tip control and can be operated by electric solenoid for remote control installations. The "Hydra-Clutch" is strictly a slow speed, heavy duty unit and has a recommended maximum speed of 200 r.p.m.



Fray-Mershon "Hydra-Clutch"



STAR

A.C. - GEAR MOTORS - D.C.

For pumps, mixers, dyeing equipment, washers, cranes, elevators, etc.

● This type STAR Gear-Motor is built in sizes from ½ to 75 h.p.* With integral 1800 r.p.m. A.C. or D.C. motors, this type will provide output speeds between 132 and 56.5 r.p.m.*

Write for complete details and Catalog showing other styles also.

STAR ELECTRIC MOTOR CO. BLOOMFIELD NEW JERSEY

WE WERE ASKED

Why Rectangular Gage Blocks Are Best

1 Their time-proved shape makes rectangular blocks convenient for gagemakers and toolmakers to handle. They're much easier to use in the "tight" places.

2 Rectangular Johansson Gage Blocks are more adaptable for use with accessories. Blocks and holders, light in weight, make accurate work easier.

3 They're only as thick as they need to be, no extra bulk. They "wring" together easily, eliminating the need for rods or screws. Using blocks without holes, the gage man makes his set-up at the center of the block, the area of greatest accuracy.

4 Rectangular blocks were the first type developed. Others were adapted from them. The rectangular shape can be used on jobs where other types cannot be used.

5 Compared with square-type blocks, the narrow measuring surfaces of rectangular blocks tend to wear evenly. That's why Johansson Gage Blocks in constant use retain their accuracy for a long time.

JOHANSSON GAGE BLOCKS

Ford

Economy

IN

Millionths

of an inch

■

Chrome Plated Gage Blocks

- **Cut overhead costs because of longer life**
- **Provide any accuracy you may require**
- **Offer greater usefulness in your plant**

DEARBORN GAGE COMPANY

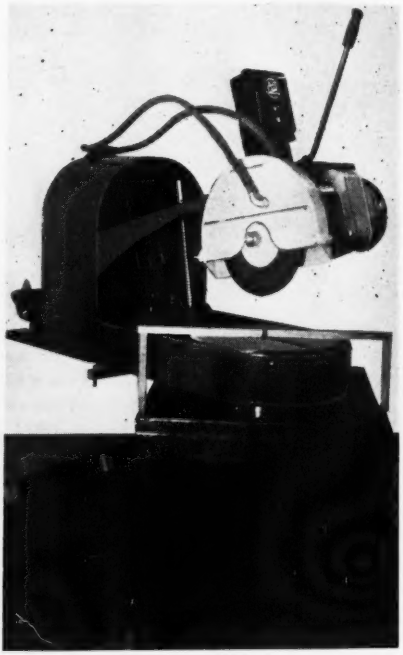
"Originators of Chromium Plated Gage Blocks"

22035 Beech Street

DEARBORN - MICHIGAN

Portman Universal Abrasive Cut-Off Machine

True precision cutting is the feature of the Universal Abrasive Cut-Off Machine now being built by the Portman Machine Co., 2236A Bathgate Ave., New York, N. Y. This wet cutting machine is designed to perform cut-off operations with tolerances held to toolroom

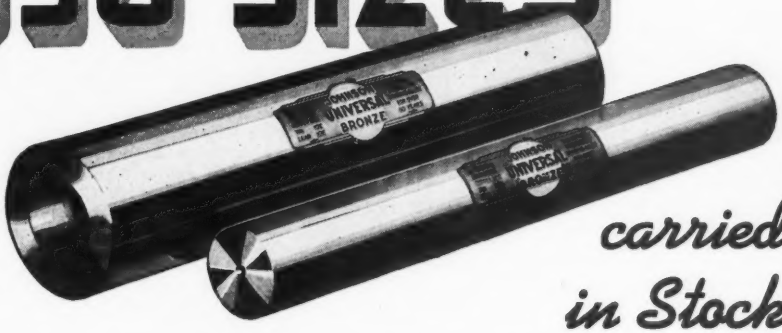


Portman Universal Abrasive Cut-Off Machine

accuracy. Such precision performance is attributed to the advanced motor and spindle unit construction of the machine. The abrasive disc spindle and motor unit direct drive design eliminates all belts and pulleys and, through the use of over-size helical gears, assures quiet operation as well as increases motor torque approximately 30 per cent.

The Portman Universal Abrasive Cut-Off Machine is powered by either a 2 or 5 h.p., three-phase, 220, 440-volt, 3,450 r.p.m. motor with the unit motor and spindle construction reducing spindle speed to 2,300 r.p.m. The motor

350 SIZES



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JOHNSON UNIVERSAL BRONZE BARS

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72 page catalogue listing and describing the most complete bronze bearing service in the world.

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● Save time and money . . . avoid delay by specifying Johnson UNIVERSAL Bronze. With over 350 sizes to choose from you can order exactly according to your needs. Conveniently located stocks permit shipment the same day your order is received.

Every bar is completely machined—I.D.—O.D. and Ends. This saves you 25% in purchased weight over rough bronze. Then too, you know in advance that every bar is usable—from end to end. Every bar is cast in S.A.E. 64—Copper 80%—Tin 10%—Lead 10%.

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JOHNSON BRONZE

Sleeve BEARING HEADQUARTERS

590 S. MILL STREET • NEW CASTLE, PA.

is totally enclosed, drip proof, and of compact dimension for power rating, being constructed with full glass insulation. It is externally fan cooled and, because of high temperature rating, the motor can be operated continuously at a temperature of 75 deg. Centigrade.

The base arm of the motor swings to 45 deg. right or left of center and can be quickly changed for angle cutting. An adjustable stop is provided on the arm for determining depth of cuts. The abrasive disc of the machine is mounted on a 1-in. spindle between special flanges. For a 2 h.p. motor, the maximum disc diameter is 12 in., while that for a 5 h.p. motor is 16 in. Maximum cutting capacity with a 16-in. disc is 3½ x 5 in. length of cut on all forms, tubing, mouldings, structural shapes, and so on, and approximately 2 in. on line of cut on solids. With 12-in. disc the capacity is 2½ x 4 in. on line of cut on shapes, and so on, and 1½ in. on solids. The offset motor spindle permits abrasive discs to be used down to the flange diameter. To assure true precision performance and to increase disc life, the spindle is mounted on Duplex Type Pre-Loaded Ball Bearings.

In addition, the Portman Universal Abrasive Cut-Off Machine is provided with a 16-in. slotted and heavily ribbed table which moves with the motor mounting base arm for all angle and straight cuts. The fence is positioned for all cutting locations of the machine, no adjustments being necessary. To assure permanent alignment, the machine is supported by a heavily ribbed cast iron base having over-size flange mounting. A separate, complete motor and coolant pump unit is built integral with the machine. The drain basin acts as a tank reservoir and is constructed with sediment baffle and drain plugs. Coolant flow to the workhead is automatically regulated while the abrasive cut-off machine is in operation.

Severance "Midget Cutter" Grinder

The Severance Tool Mfg. Co., 1516 E. Genesee Ave., Saginaw, Mich., has brought out a "Midget Cutter" grinder for use in free-hand grinding of Midget Milling Cutters and Rotary Files, taps, chasers, small drills, countersinks, counterbores, and other small tools. In addition, the Midget Cutter Grinder is said to be ideal for free-hand fluting

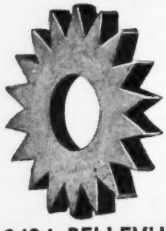
SOMEBODY'S GOING TO GET A DARN GOOD DRESSING DOWN

TO get real performance from your grinding wheels, they need a good dressing regularly.

The best way to be sure the job is done right, is to use New Improved Vincent-Huntington dressers with bushings that can't turn and wear out the bearing holes in the handle.

These new type Huntington dressers, equipped with Milled tool steel cutters, heat treated by the "Vincent Process" to the proper degree of hardness and toughness, is your assurance that the dressing will be well done.

Call your nearest Mill Supplies distributor. Insist on the dressers with the aluminum finish.



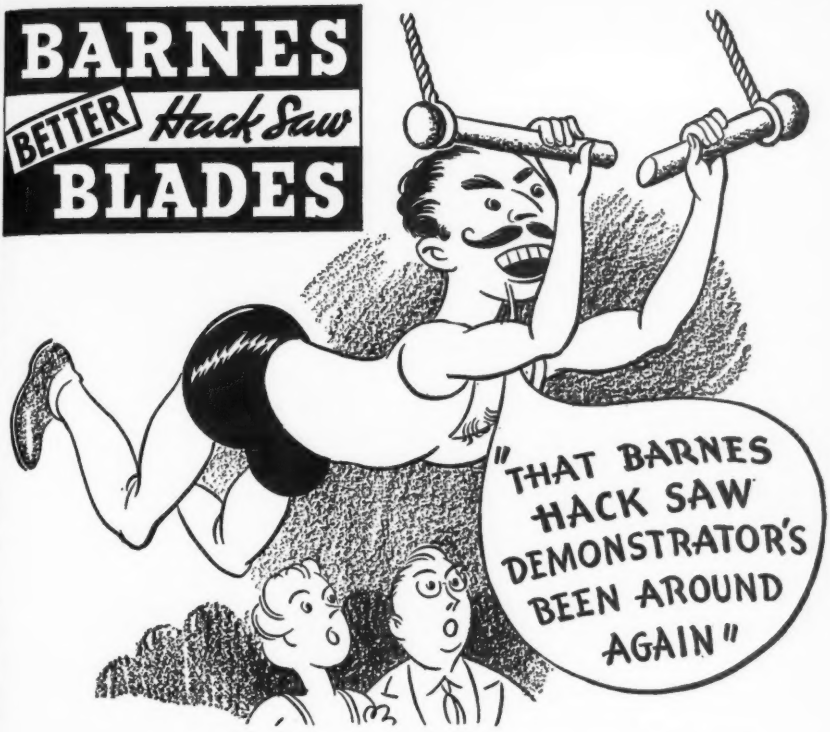
Write for descriptive catalog sheets

Vincent Steel Process Co.

2434 BELLEVUE AVENUE • DETROIT, MICHIGAN

"IF IT'S A HUNTINGTON DRESSER OR CUTTER VINCENT MAKES IT"

BARNES BETTER Hack Saw BLADES



Barnes Field Men, unlike the man on the flying trapeze, are not tricksters. They go out on the job, look over the metal cutting problem involved, select the right blade for the work and then let the mechanic make his own demonstration.

It's as simple as that!

So if you have a metal cutting problem that's disturbing you, just ask your distributor to place you in touch with a Barnes Field Man -- or write to us direct.

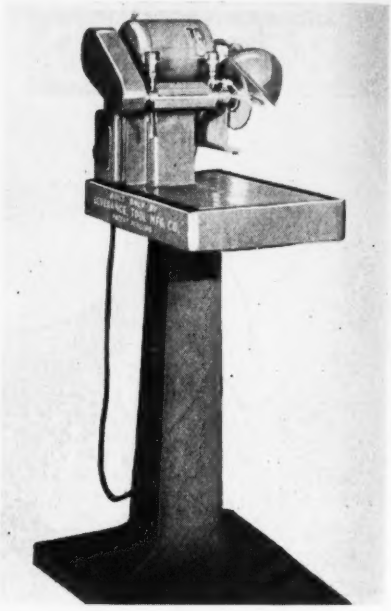
There's no obligation.

W. O. BARNES CO. INC.
DETROIT MICHIGAN

of taps, reamers, and end mills, either straight or spiral, and also for the grinding or polishing of parts out in the plant.

The grinder is powered by a 1/3 h.p., ball bearing, 3,400 r.p.m., 3-phase, 220-volt motor which is located directly behind the spindle. A recessed manual motor starter equipped with a toggle type relay switch is connected to the motor by means of a flexible conduit. The table, riser, spindle extension bracket, and motor bracket are cast integrally, and the grinder is designed for either three-point mounting on a pedestal or for four-point mounting on a bench having a table overhang of 6 in. The spindle is of precision design and is equipped with Sabeco bronze bearings. Adjustment of the front. rear, or thrust of the spindle is made independently. Lubrication is provided to each bearing direct from drip-drop oilers through filter pads.

A scientifically designed wheel guard incorporating a dust chute with a 2-in. outlet to a suction system double protects the operator, and is provided with a light of flexible conduit. A knurled knot readily releases the wheel guard for adjustment of the grinding wheel as the latter becomes worn. The belt and pulleys of the grinder are also equipped with guards. Speed changes (2) are instantaneously made and belt tension set by the action of one binding lever.



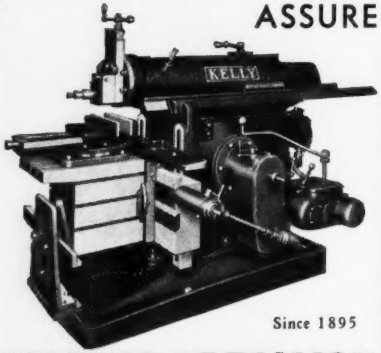
Severance "Midget Cutter" Grinder

Spindle speeds of the Midget Cutter Grinder are 5,500 and 6,100 r.p.m. Wheel sizes, 6 in. Overall height, 51 in.; to table top, 36½ in. Table size, 15 x 22 in. Floor space required, 22 x 22 in. Weight, 300 pounds.

B & S Change Gear Guard

Completely enclosing the gearing which drives the headstock of the Universal Spiral Index Centers used on Brown & Sharpe Milling Machines, the guard shown in the illustration is designed particularly for use in cases where the lead of the spiral being cut is such as to cause the gears to rotate with dangerous rapidity. The guard, introduced by the Brown & Sharpe Mfg. Co., Providence, R. I., allows the standard set of change gears to be used, and the hinged construction permits the cover to be opened wide to allow

KELLY SHAPERS
ASSURE



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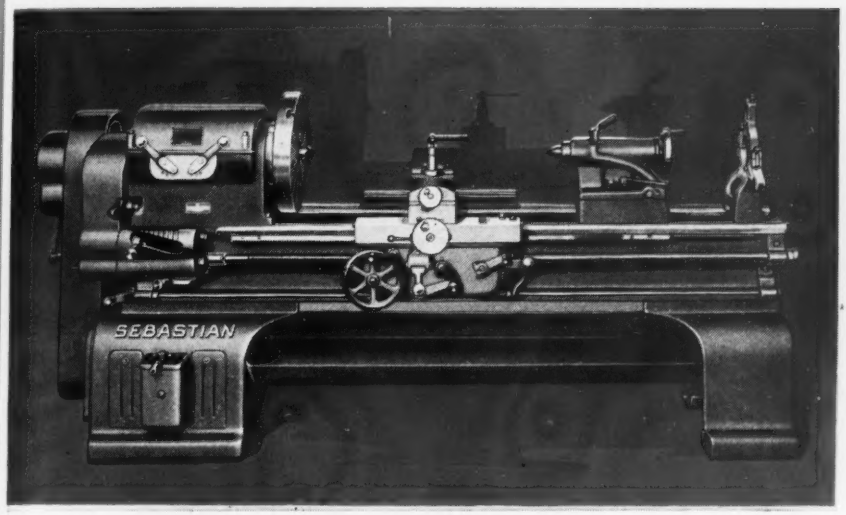
General Engineering & Mfg. Co.
ST. LOUIS • MISSOURI



It's 10 to 1 a Sebastian will do it!

Low priced *Sebastian Lathes will handle 90% of all modern turning jobs.*

Any job of routine production turning is made-to-order for a Sebastian Lathe.

Whatever the job, it will pay you to see a Sebastian dealer—before you buy the equipment. For Sebastian Lathes are designed to handle 90% of the turning jobs in up-to-date industrial production. They are manufactured under production methods and exacting precision standards. They are, on this basis, less costly to produce and this saving is passed along direct to you.

If no Sebastian dealer is convenient write the Sebastian Lathe Company—Box 1017-B, Cincinnati, Ohio.

PRICES

All - Timken Equipped Geared Head Lathes including Motor and Switch.

12 x 4	$1,100.00
14 x 5	1,600.00
16 x 6	1,660.00
18 x 6	2,000.00
20 x 8	2,130.00

F.O.B. Cincinnati

See

Adopt the motto of smart machinery buyers everywhere—

SEBASTIAN *GEARED HEAD* *TIMKEN BEARING* LATHES

First!

Designed and built under the most up-to-date and exacting quantity production methods — to meet 90% of all modern industrial requirements.

Manufactured under rigid precision standards and guaranteed to give efficient performance in the field for which they are designed.

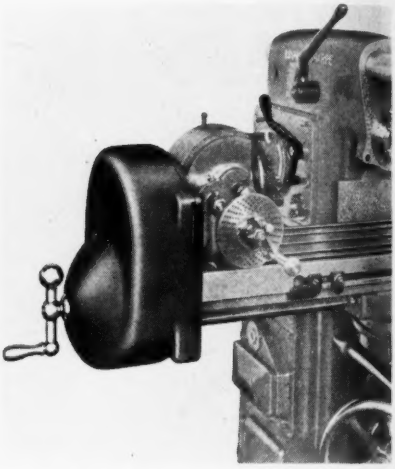
UNIVERSAL
COLLET CHUCKS
TWO NEW SIZES AND TWO NEW IMPROVEMENTS

Two new features of Universal Collet Chucks are (1) ground threads, and (2) a handy wrench grip on the shank. Two new sizes now offered are type O.W. from $\frac{1}{16}$" to $\frac{3}{16}$" and type XZ $\frac{3}{4}$" to 1½"

UNIVERSAL
Engineering Company
Frankenmuth, Mich.

full freedom in changing the gears.

The B & S Change Gear Guard is made of aluminum alloy for lightness and ease of handling, and is quickly placed in position or removed from the machine, being held in place simply by two screws which attach it to the table. On machines provided with power fast travel for the table, the safety handcrank is removed and longitudinal adjustments are made by means of a handwheel. On machines not provided with power fast travel, a keyed shaft extension and handcrank, as shown in the illustration, are furnished for the purpose; adjustments in this case being made with the guard closed.



B & S Change Gear Guard

When the change gear guard is used on B & S "Light Type" Milling Machines, the maximum longitudinal table travel is decreased by 1½ in., and the clockwise swing of the table is limited to 43 deg. On standard Type and Dual Control Type Milling Machines, the capacities remain unchanged. The B & S Change Gear Guard is available in three styles, No. 0, 2, and 3.

Masterdrive

A line of machine tool drives for punch presses, milling machines, shapers and lathes has been announced by the Industrial Equipment Division of The Master Electric Company, Dayton,

for Quality and Quantity Production Shift to

MO-MAX*

TRADE MARK REG. U.S. PAT. OFF.

MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL

For booklet with basic data, write
THE CLEVELAND TWIST DRILL CO., CLEVELAND

Photo Courtesy Warner & Swasey

MADE AND SOLD BY THESE LEADING STEEL COMPANIES UNDER THEIR TRADE NAMES

UNITED STATES

Allegheny Ludlum Steel Corporation
Bethlehem Steel Company
Braeburn Alloy Steel Corporation
Carpenter Steel Company
Crucible Steel Company of America
Henry Disston & Sons, Inc.
Halcomb Steel Division, Crucible Steel Company of America
Jessop Steel Company
Latrobe Electric Steel Company
Simonds Saw and Steel Company
Universal-Cyclops Steel Corporation
Vulcan Crucible Steel Company

CANADA

Atlas Steels Limited
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GREAT BRITAIN

Atlas Steels Limited
Deutsche Edelstahlwerke A. G.

FRANCE, GERMANY, ITALY, SWEDEN

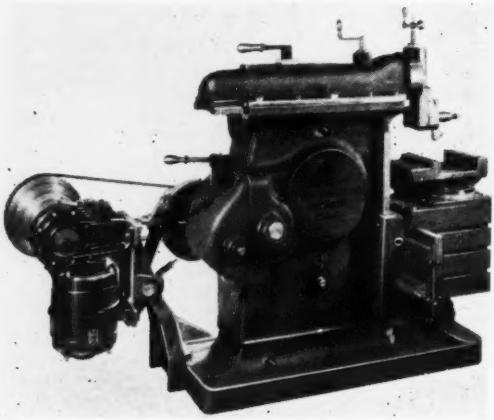
Deutsche Edelstahlwerke A. G.

* MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company, and its only licensed use by others is on steel made and sold by licensees under patents owned or controlled by said Company.

8858

Ohio. This line of power equipment, known as Masterdrives, has been produced in answer to the demand for independent machine tool power units offering increased safety, efficiency, and economy.

The Masterdrive combines a Master Gear Head Motor and a correctly designed super-structure in a single rugged unit that can be attached in a few hours to machine tools of usual designs. A wide variety of models makes it possible to select Masterdrives that deliver maximum performance with minimum power requirements.



Masterdrive

Among the advantages claimed for the Masterdrive are economy, a possible increase in efficiency of up to 25 per cent, improved head lighting, greater safety, lower upkeep, noise reduction, elimination of delays due to belt failures, and freedom from chain failures. The drive does not coast when power is shut off.

The Masterdrive is available in five models for application to the lathe, five for the milling machine, five for the shaper, and six for the punch press, the horsepower ranging from ¾ to 5 h.p., depending upon the model.

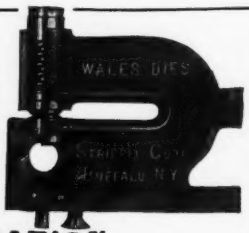
T.C.M. "All-in-One" Grinding and Lapping Machine

Maximum flexibility is the principal feature of the "All-in-One" Grinding and Lapping Machine now being built by T.C.M. Manufacturing Company, Harrison, N. J. The machine is intended for all of the various grinding and lapping operations required on high speed steel, Stellite, cemented carbide, and similar tools. Grinding speed is low to prevent burning or checking. Rough grinding is done on an aluminous oxide wheel and the tools are polished on a 400 grit rubber wheel which produces a high polish on the cutting face and along the cutting clearances, increasing tool life and decreasing tool cost.

Tilting tables are provided which can be tilted as much as 40 deg., a quadrant being provided to control the amount of tilt. The tables can be moved to any position desired so that grinding can be done on the face of a cup wheel as well as on the periphery. Vertical adjustment of the tables allows grinding a tool edge on the center line of the

WALES HOLE-PUNCHING and NOTCHING DIES

For PUNCHING round or shaped holes any place in all sizes of flat sheets • For NOTCHING four corners and V's in between • For NOTCHING DEVELOPED CORNERS for round cornered casings • For COMBINING all kinds of notches and punches in one operation. NOTHING ATTACHED TO THE RAM OF THE PRESS



Write for Bulletin A

THE STRIPPIT CORPORATION

1559 NIAGARA STREET **BUFFALO, N. Y.**

SELF~SEALED

"7000" Series

"7000-P" Series

"77000" Series

SUPERIOR

BECAUSE OF THE FOLLOWING ADVANTAGES:

Thick, closely-fitting felts, providing extra protection.

Effective labyrinth formed by felt seal and plates against recessed inner ring.

Felt seal removable in its entirety — for inspection, cleaning or renewal of grease.

Felt seal entirely within confines of both rings and therefore not exposed to injury.

Seal construction avoids race distortion, assuring dimensional exactness and quiet running.

Wide, solid inner and outer rings with maximum contact on shaft and housing, making inserts in housing unnecessary and militating against slippage, looseness and escape of lubricant past outer ring.

Grease capacity ample for long periods of service.

Write for the Catalog, describing the Most Complete Line of Self-Protected Bearings in America. Let our engineers work with yours.

"NORMA-HOFFMANN"

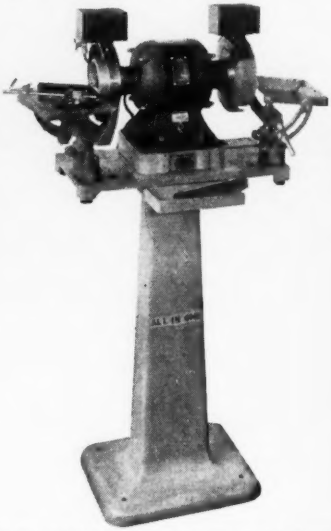
NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN. U.S.A.

For burring tubes (inside, outside, or both at one time) Severance Cutters are unique. Because they are hand-ground from the solid after hardening by a method similar to the old artisan trade of cut glass grinding, they do a faster, cleaner job than ordinary cutters — and they may be reground an unlimited number of times. Because of their special segmental pattern, they cannot chatter. Satisfaction guaranteed or your money back.

Write for FREE illustrated Bulletin 12-T.

SEVERANCE
TOOL MANUFACTURING COMPANY
1516 E. Genesee • Saginaw, Mich.

wheel. Cemented carbide tips can quickly be cut to close dimensions by means of a tip-cutting attachment. Chip control grooves can quickly be formed in carbide tools without danger of cracking or checking the carbide tip. The maximum grinding speed of less than 2,700 ft. per minute on the 6-in. diameter wheel prevents undue heating of the carbide tip without sacrificing tool sharpening time. For the



T.C.M. "All-in-One" Grinding and Lapping Machine

performance of many tasks that otherwise would have to be done on a surface grinder, a protractor is provided with micrometer feed adjustment. Diamond metal laps are provided for lapping carbide tools.

Red Devil Demagnetizers and Etchers

A device for use in marking tools and small parts for identification, to be marketed under the trade name of "Red Devil," has been developed by the Grinding Machinery Co., 2832 E. Grand Blvd., Detroit, Mich. The device is available in four models: bench model, portable model, combination demagnetizer and etcher, and etcher. All models are equipped with a quick-acting switch and a red light to notify the operator

FORMICA WHEELS
- FOR FACTORY TRUCKS!

FORMICA molded wheels for factory trucks provide an elastic, silent material that has unusual chemical inertness and resistance to injury by destructive materials used in many industrial processes. They stand mechanical wear exceptionally well, also. These wheels have made a record of unusual service in many difficult installations, and have reduced the cost of maintenance on factory trucks. They can be adapted to trucks of many types and sizes.

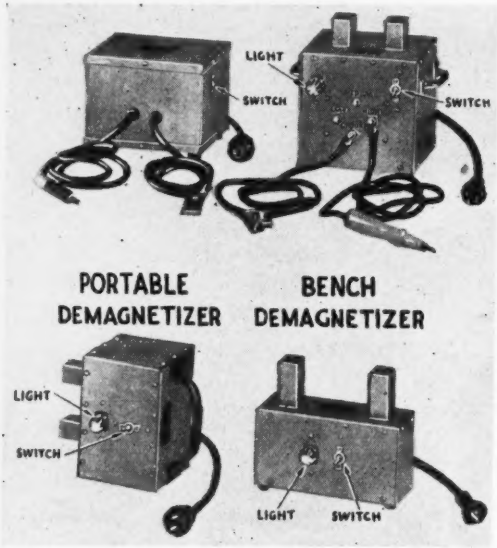
FORMICA

THE FORMICA INSULATION CO., 4632 SPRING GROVE AVE., CINCINNATI, O.

when the unit is in operation. To make the Red Devil units portable, each model is provided with handles and a set of four rubber feet.

The etching models are equipped with non-welding or sticking alloy tips which require infrequent honing with an oil stone but which are never ground. To vary depth of etch, three adjustments are provided on the combination unit and two on the etcher. These adjustments are essential when etching thin parts in order to prevent markings from showing through the work.

The Red Devil units are built for 60 cycle, 120 volt, A.C. current and can be plugged into any standard lighting circuit having these specifications. Each unit is provided with a 6-ft. electric cord with plug. Approximate overall dimensions for each unit are 6½ in. high, 6½ in. long, and 5 in. wide. Unit approximate net weight, 10 lbs. Special type Red Devil units can be made to order.



Red Devil Demagnetizers and Etchers

Weltronic Welding Timer

Designed for use with gun, spot, projection, and automatic welding equipment, Weltronic Corporation, 2832 E. Grand Blvd., Detroit, Mich., has developed a line of electronic welding timers including models ranging in application from single spots to multiple automatic spot welding. Up to 600 spot welds per minute in regular production have been made with these timers.

Simplicity and positiveness in operation are effected through the use of electronic tubes, reducing the number of moving parts to such an extent that but a single relay and a single tube are now required for full automatic control of a gun, spot, or automatic welding machine. Virtually any combination of welding factors desired can be selected.

Included in the controls available are the following: (1) Regulation of "start" of welding current. (2) Setting of cut-off time of welding current. This may be adjusted anywhere from 1 to 40 cycles of current of welding time. (3) "Cooling" time control to regulate length of time electrodes will remain in contact

NEEDLE POINT DIAMOND TOOLS

Indispensable in grinding taps, threads, gauges and for sharpening corners and contours on fine grain wheels.

SEND FOR SPECIAL CIRCULAR

F. F. GILMORE & CO.
112 Dartmouth St. Boston, Mass.

$1.00 EACH

N-2 N-1

Complete line of Standard and Special Diamond Tools

Discounts in quantities

LUFKIN
HEAVY-DUTY MICROMETERS

Here's the ideal "Mike" for your production work. You can give it plenty of hard use and need NEVER doubt its accuracy. The frame is extra sturdy though comparatively light weight and the action is as smooth as velvet. The Lufkin system of markings gives accurate, positive readings at a glance and the exclusive adjustment features let you keep the tool permanently accurate. Made in sizes from 1 to 12". Send for Precision Tool Catalog No. 7.

BUY THROUGH YOUR DISTRIBUTOR

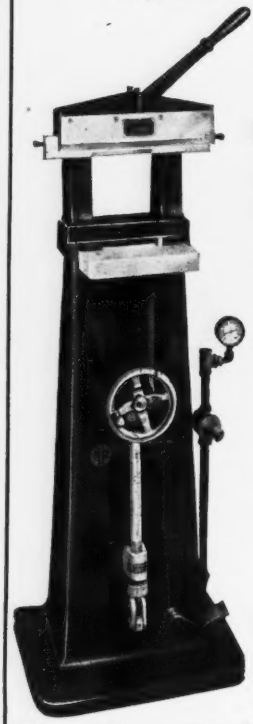
NEW YORK
106 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS

YOUR PRODUCTS
ALWAYS
IDENTIFIED
IF PERMANENTLY
MARKED
IN THIS MACHINE



MARKING BY ROLLING IS FAST AND ECONOMICAL. PRESERVES DIE LIFE AND PIECE PARTS. REQUIRES ONLY FRACTION OF APPLIED PRESSURE AS COMPARED TO STAMPING.

QUICK SET-UPS

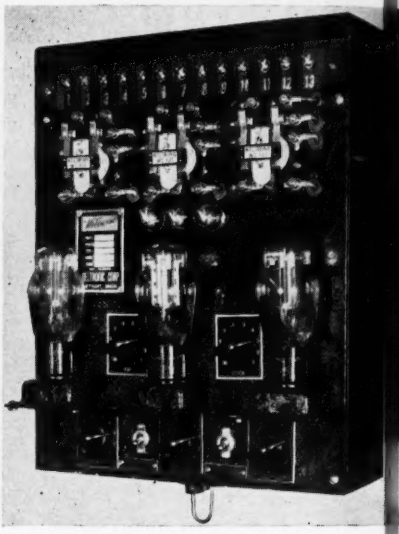
MODEL 25
HI-DUTY
MARKING
MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILL.

with the work after welding current has been cut off to permit annealing of the work. (4) Number of interruptions of welding current during the welding operation. (5) Length of welding time in cycles. (6) Time delay before welding current goes on after electrode pressure has been built up.

Of particular interest is the controller's interrupted time model, permitting the welding of extremely heavy (thick) sec-



Weltronic Welding Timer

tions, heretofore considered impossible to weld. With the Weltronic timers and modern hydraulic spot-welding equipment, sections up to ½ in. thick each can be welded together successfully in regular production. Standard relays, electronic tubes, and so on, are used in the construction of all controls of Weltronic timers, enabling selection of any combination of controls.

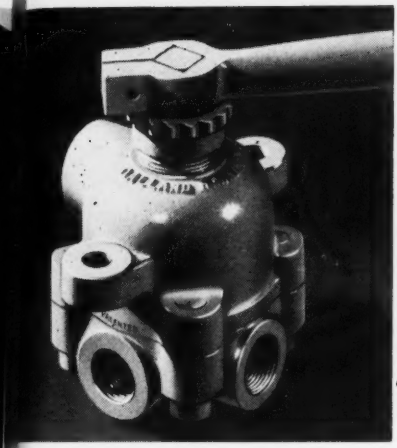
For automatic spot welding, the timer will automatically open and close the electrode at periodic intervals, determined by the setting of time relay units on the panel of the timer.

The timers are available for standard voltages of 110, 220, 440, or 550 with current frequencies of 25, 50, and 60 cycles, and push button control voltages of 110, 220, or 6 volts. They may be used with all types of tube and mechanical contactors.

NOPAK

3 and 4-Way Operating Valves

FOR AIR, WATER AND OIL

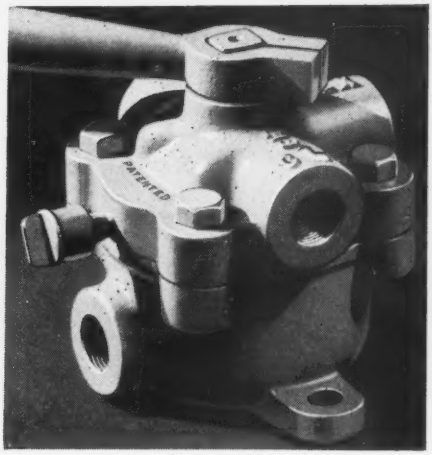


FOR OIL OR WATER

e flat disc type design incorpo-ed in the NOPAK valve permits iform lapping of the disc and at, allowing continual operation actually improve the sealing faces.

e absence of packing provides absolutely leakproof stem ar-ngement entirely free from any intenance whatsoever.

OPAK valves utilize the pressure seal the valve at all times, are sy to operate, provide positive tion and full pipe area through e valve.



FOR AIR

- ★ No Packing
- ★ No Maintenance
- ★ Leafproof
- ★ Protected Disc and Seat
- ★ Quick or throttling action, as desired

Write for Bulletin 65

GALLAND-HENNING

MANUFACTURING COMPANY

2758 South 31st Street Milwaukee, Wisconsin

Minster No. 50 Series Double Crank Straight Side Presses

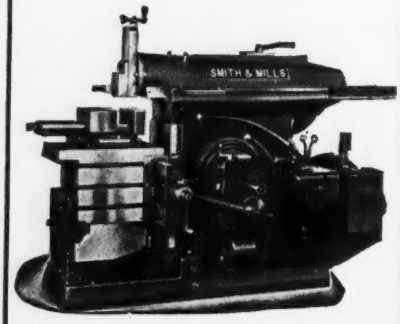
The Minster Machine Co., Minster, Ohio, announces its line of No. 50 Series Double Crank Straight Side Presses with improved box type sections for frame members. The illustration shows a No. 50-4½-42 Minster Double Crank Straight Side Press, having a 74-ton capacity and a bed length of 42 in. The slide ways are exceptionaly long, and during the working part of the stroke the entire length of the gibs afford a bearing surface. This method of construction permits unbalanced load conditions to be set up without tilting the slide.

The box type crown has a section below the center line of the crankshaft as well as above, thus rigidly supporting the crankshaft. In the larger presses, slide counterbalance cylinders are mounted in the crown, which requires neither additional ceiling height nor projections outside of the frame members.

The No. 50-4½-42 Minster Press is lubricated from a central point, and the system is confined within the closure of the press. The wiring and control panel for the press control circuit are also enclosed. The base of the machine has a deep section and a minimum of projection to facilitate accessibility with trucks and to eliminate foot hazards. The press is equipped by either an air or hydraulic combination friction clutch and brake, and is controlled electrically with push buttons which are conveniently mounted. Smaller size presses in the No. 50 Series can be furnished with the Minster Multi-Engage Spline Clutch.

No. 50-4½-42 Minster Double Crank Straight Side Press

SMITH & MILLS SHAPERS

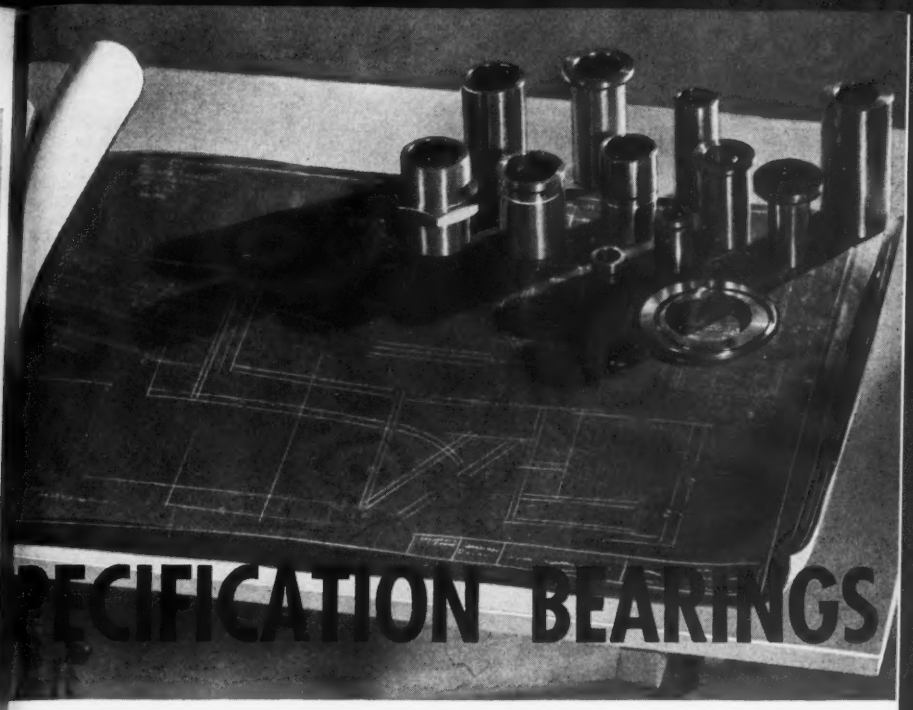


Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

THE SMITH & MILLS CO.
CINCINNATI • OHIO

Hydratrol Extra Heavy Duty Lathe

Hydratrol Lathes—product of Lehmann Machine Company, St. Louis, Mo.—are now being built in the extra heavy duty type in from 24 to 36-in. sizes. Illustrated herewith is a 24-in. machine with standard Timkenized spindle. Sixteen spindle speeds are available, any one of which is obtainable by turning one handle on the front of



PECIFICATION BEARINGS

TO MEET *any blueprint* REQUIREMENT

Buckeye's 787 standard sizes of finished ready-to-use bushings are the time-proven answer to most industrial requirements. For others, the entire facilities of this 38-year old organization are at your service. • "Special bearings to customer requirements" are available in phosphor and gun metal analysis, 3 grades of high lead bronze, and any special analysis that may be needed—slotted or split, in an infinite variety of I. D., O. D., and lengths with or without flanges, lugs, oil grooves, oil holes, etc., exactly to meet the requirements of your particular conditions. Let us show you how Buckeye's wide experience and extensive pattern and machine facilities can save you time and money. Inquiries answered promptly. Let us quote on your requirements.

No order is too big or too small for Buckeye

SEND FOR THE BUCKEYE CATALOGS

Catalog 137 lists 787 sizes of ready-to-use industrial bushings and 154 sizes of cored and solid bars.
Catalog "O" lists 268 sizes of Electric Motor Bearings.
Sent on request. Write today.

Write Cleveland direct on blue print and specification requirements.

Buckeye

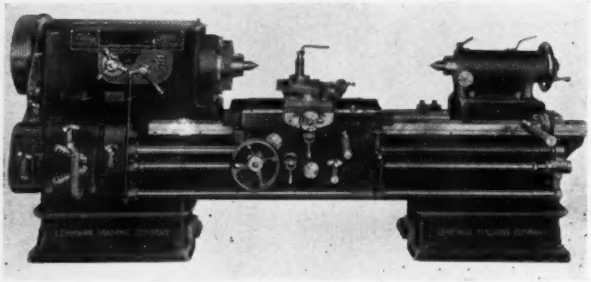
BRASS AND MANUFACTURING COMPANY

BRONZESMITHS SINCE 1900

6412 HAWTHORNE AVE. CLEVELAND, OHIO

the headstock. Turning this handle also operates a slide rule which gives the spindle speed in revolutions per minute and the cutting speed in feet per minute for any work diameter. It also provides the setting for numbered operations providing predetermined, correct speeds.

The hydraulic driving clutch is self-compensating and requires no adjustment at any time. Hydraulic primary and spindle brakes are also self-compensating. The spindle can be freed so that it can be turned by hand, as in chucking work, by turning a small handle at the front of the headstock which immediately disengages the spindle from all connections. Reverse to the spindle is provided for all speeds and forward speed, brake, and reverse is controlled by handles on the front of the apron and on the front of the headstock. All parts of the mechanism are lubricated by a pump which circulates or sprays filtered oil. If the oil runs below the level required to afford adequate lubrication, the machine will stop until the oil supply is replenished.



Hydratrol Extra Heavy Duty Lathe

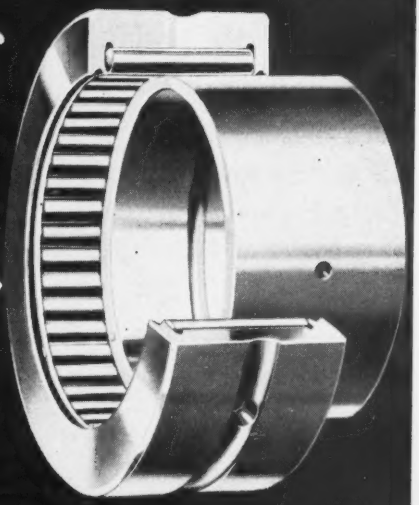
Many refinements have been introduced in the design and construction of other parts of the lathe, particular attention having been given to the use of anti-friction bearings, proper enclosure of same, and automatic lubrication. There are 88 roller and ball bearings in the machine illustrated. The carriage weight is partially sustained on ball bearing rollers, but at all times maintains sliding contact with the bed with the result that the effort required to move the carriage by hand is reduced by less than one-half.

The apron is completely enclosed, back and front, forming an oil reservoir from which oil is pumped through a filter to distributing channels at the top from whence it flows by gravity through the bearings. All shafts or gears which turn on studs have anti-friction bearings supported at both ends. The rack pinion has two large roller bearings inside the apron with an additional outboard roller bearing sealed to the outside and automatically lubricated. The weight of the heavy tailstock is partially sustained on ball bearing rollers but is never raised to destroy sliding contact with the bed. The quick change mechanism is completely anti-friction equipped, the bearings being sealed to retain oil and exclude dirt. The end gear train to the quick change mechanism also operates on sealed roller bearings. Steel parts throughout the lathe are made of selected alloys, heat treated and hardened to meet the various requirements

Wire-Working Machinery
Wire Mill Equipment
Sleeper & Hartley, Inc.
Designers and Builders
Worcester, Massachusetts

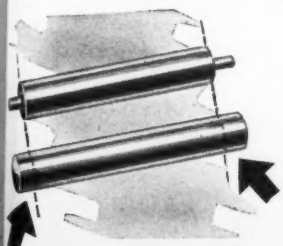
HERE it is

The New



McGILL "Solidend" MULTIROL

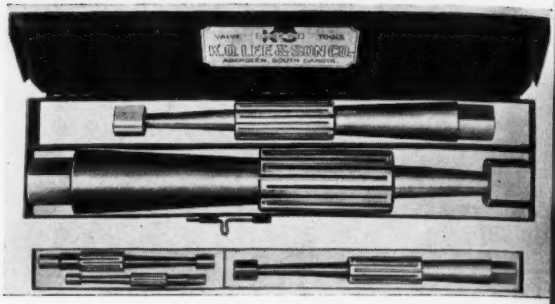
Here is the NEW full-contact roller bearing that has many features not found in the trunnion type. Self-contained, approximately 12% more load-carrying capacity, elimination of end washers and retaining rings . . . these are a few of the advanced engineering principles found in McGILL "Solidend" *MULTIROL* Bearings. Rounded-end rollers (not trunnions), no accidental disassembling, used with or without inner raceway. Minimum of clearance between end shoulders and inner raceway makes bearing self-sealing. Simplified construction means lower cost in manufacturing — lower cost to you — and a bearing that is easier and cheaper to install. Available in a variety of size combinations for shafts up to 5 inches. Write for further details.



McGILL MANUFACTURING COMPANY
1500 N. Lafayette Street
VALPARAISO • INDIANA

and gears are lapped on the Lehmann patented lapping machine. The 24-in. machine shown here weighs 17,400 lbs. arranged for motor drive but not including motor.

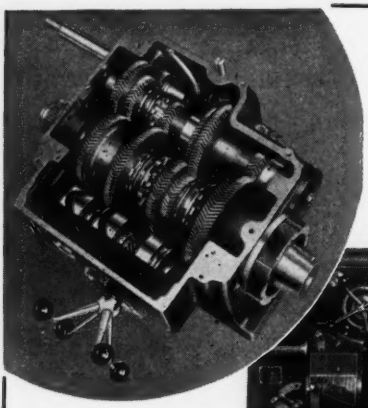
K. O. Lee Knock-Out Expanding Mandrels



K. O. Lee General Purpose No. M101 Mandrel Set

Knock-Out Expanding Mandrels suitable for all classes of work and materials are now being manufactured by K. O. Lee & Son Co., Aberdeen, S. D., in sets of various sizes. The mandrels are made in two series, one series for general purpose work, and the other for heavy duty work. Due to the greater taper per foot and larger range of the general purpose mandrels, these mandrels are especially suited for tool room and general repair work. The heavy duty mandrels, having less taper and smaller range, are more adaptable for manufacturing operations where heavy cuts with fast feeds are taken.

The Knock-Out Mandrels are made of tool steel, hardened and precision ground, and are said to be accurate within 0.001 in. It is stated that this accuracy is maintained indefinitely due to the fact that the "live" center, which is subject to wear on each mandrel, is replaceable. Auxiliary centers afford an unusually large wearing surface and oil reservoir for constant lubricating.



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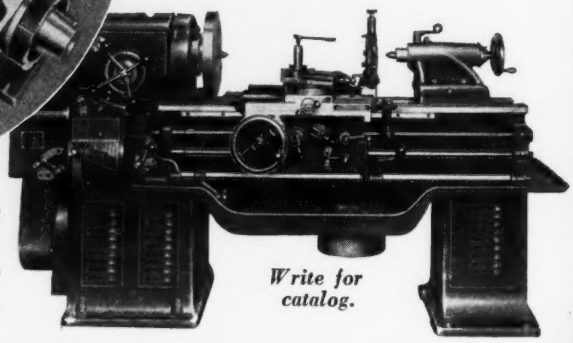
An all-herringbone transmission, composed of 19 continuous-tooth gears, completely eliminates all gear tooth or tool marks from the work. Controlled by Monotrol (1 dial) or Tritol (3 levers). Sizes 14" to 24".



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ery thread is clearly defined – so distinctly as to pear magnified – when the detail-revealing light of ooper Hewitts is used. Giving operators the best light ailable makes the mere physical act of seeing easier oil-consuming eye-fatigue is reduced – dividend-ducing shadows are virtually non-existent. Result: re uniform high-quality production is assured. Every eration, including inspection, is easier, more accurate d faster when this "better than daylight" illumination ued. » » » Sharp, clean-cut Cooper Hewitt lighting ts less than ever before. Plants where appropriations are closely controlled down to the last penny are installing Cooper Hewitts right now – as the best means of spending slim modernization budgets. They are benefiting from over 30 years of experience in the application of engineered light to practically every textile operation. Give us your toughest job – then you be the judge. General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey.

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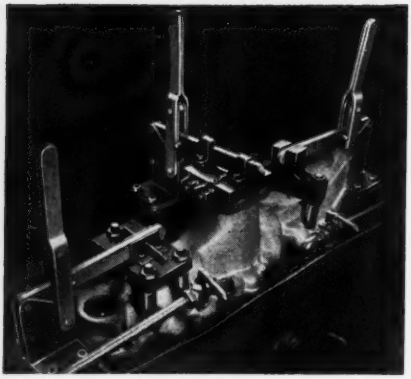

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Fellows No. 6M Involute Measuring Machine

The Fellows Gear Shaper Company, Springfield, Vt., has just announced a new measuring machine which operates on an entirely different principle from machines heretofore employed for checking involute shapes. This machine, a front view of which is shown in Fig. 1, operates without the use of base rolls, tapes, or sine bars, and instead employs a master involute cam. The position of the main slide is set with standard size blocks, and automatically locates the involute pointer at the correct base circle radius for any gear within the capacity of the machine.

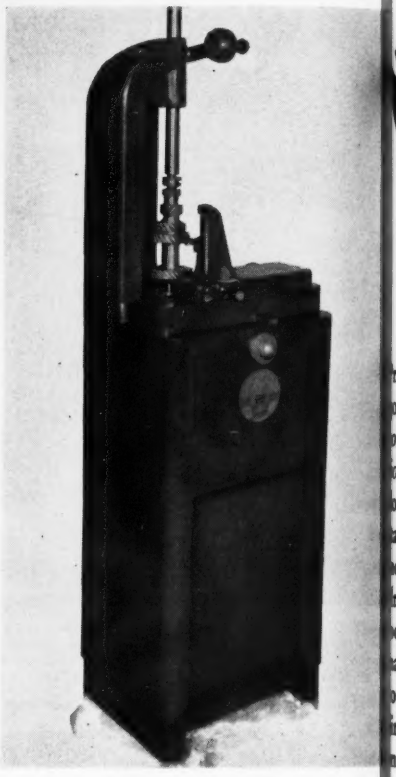

Fig. 1—Front View of Fellows No. 6M Involute Measuring Machine.

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For sanding, metal finishing, grinding, cleaning; shock absorbing spindle for smooth operation. 7″ disc; 4200 R.P.M. Price—$39.50. Others to 9″ disc—$92.00.

MILLERS FALLS COMPANY GREENFIELD, . . MASS . .

Another block sets the involute pointer in the so-called "starting" position. Provision is also made for checking tooth modifications, a graduated dial being employed in connection with the dial indicator.

Obviously, this machine greatly simplifies the checking of involute tooth shapes. It is also possible to check both sides of the teeth without removing the gear from the centers. The involute pointer is rotated in the holder and the dial indicator swung to the reverse position. The lever that operates the dial indicator is in the form of a "Vee" so that contact can be made with the indicator for checking both right and left-hand sides of the teeth.

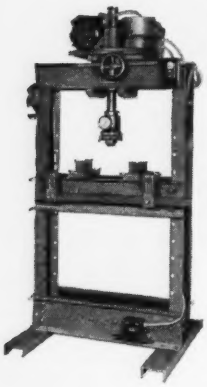
The operation of the machine does not rely upon friction, and consequently, gears of small diameter can be checked as accurately as gears of larger size. Another feature, and a highly practical one, is that the machine can be used to easily determine a base circle of unknown diameter.

It is important in the checking of an involute that the pointer be set exactly at the point of origin. On this machine once the main slide is set at the correct base circle radius, the "starting" position of the involute pointer is automatically located by a setting block as shown in Fig. 2. A calibrated master gage is provided with each machine for setting the pointer in the "radial" position, for rough and accurate settings for a point of "origin," and a master involute for check-

Fig. 2—Close View of No. 6M Involute Measuring Machine, checking a Four-step Cluster Gear—Operator Setting Involute Pointer in "Starting" Position.

ing the operation of the machine. An other feature of note in the design of the machine is the holder that carries the involute pointer. This is mounted on a vertical bar and can be moved up and down on this bar by a rack and pinion to position the pointer relative to the gear.

The machine is of such simple design, and is so easily operated, that it is only a matter of seconds to change from one size of gear to another. For example, a four-step cluster gear, such as shown in Fig. 2, can be handled without removing the work from the centers; that is, the teeth on all four steps can be checked at one setting of the work. This is made possible by having the work spindle capable of



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function always to your advantage. You demand a unit to exert the right amount of power at the right speed. In addition to this, you require that this power be applied repeatedly, without failures in timing and without time out for replacements or adjustments. You require a cylinder designed and built to successfully withstand fatigue, one that incorporates the use of packings that require no adjustment, one whose design throughout is controlled by features which count for service, one that takes the TOUGHEST jobs in its stride. These "service" features of T-J Air Cylinders are described in our catalog No. 36. It will help you too in selecting the type of equipment best suited to your installation.

THE TOMKINS-JOHNSON CO.
620 N. Mechanic Street, Jackson, Michigan

Agents in Principal Cities

elevation and the tail center adjustable. The tail center is the "live" type, and as the handle is provided with a weight, it is not necessary to use a driving dog to keep the work following the driving center. In changing from one gear to another, only two main settings are required; namely, setting the main slide at the correct base radius, and setting the pointer slide in the "starting" position.

The machine operates on the well-known principle that all involutes developed from the same base circle radius are the same, and that the only way in which the shape of the involute can be changed is to change the base radius. The master involute cam is developed from a base circle radius greater than the maximum capacity of the machine, and for checking smaller base radii, it is only a matter of changing the radial distance of the pointer relative to the axis of the gear. The rate of travel of the slide carrying the indicator is then changed automatically to agree with the base radius setting, thus making possible the checking of involutes developed from any diameter of base circle within the capacity of the machine. The machine will check gears up to 6 inches pitch diameter, and the indicator pointer holder has a movement of 3½ inches.

Rexalloy Tool Bits

A tool material consisting of a non-ferrous cutting alloy in which basic elements of cobalt, chromium, and tungsten are said to be accurately balanced and controlled, has been developed by Crucible Steel Company of America, 405 Lexington Ave., New York, N. Y. Known as "Rexalloy," the material has such a high degree of hardness at elevated temperatures that it is said to be practically unforgeable. Hardness and structural stability at extreme temperatures is indicated by the fact that, after being brought up to 2,000 deg. F., a drop of only one point in hardness is indicated on the Rockwell C scale. Toughness and unusual resistance to abrasive wear are outstanding properties of the cast alloy.

Rexalloy is offered in tool bit form for use on practically any and all machining operations. Proper grinding is readily accomplished with ordinary tool room equipment, and Rexalloy bits may

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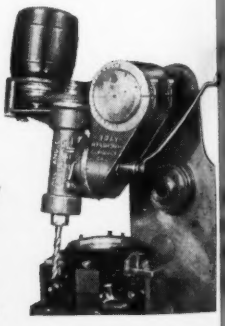

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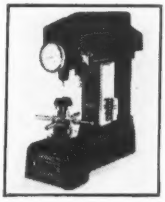

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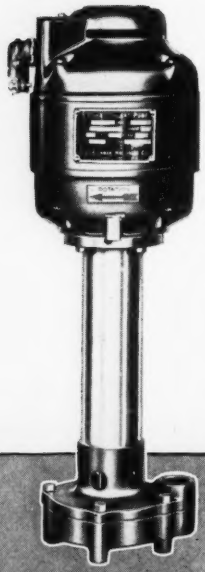

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Users take the dependable flow of coolant for granted. That's why you'll see hundreds of machines equipped with "GUSHERS"—they can be put on and forgotten.

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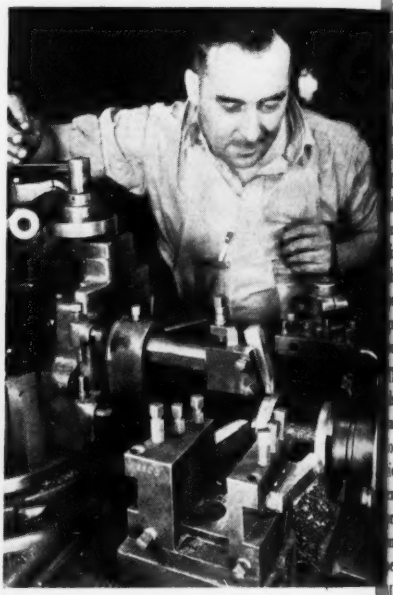
538 E. FRONT ST. CINCINNATI, OHIO

be ground either by hand or machine and either wet or dry. Tool cutting angles suggested are those customarily applied for steel tool bits. The table of speeds and feeds given here may be used as a guide.

Material	F.P.M.	Feed
Cast iron	150	0.125
Steel castings	140	0.033
SAE 3140 (300 Brinell)	100	0.025
Cold Rolled	250	0.033
Copper	300	0.030
Stainless steel (18-8 type)	250	0.015

Rexalloy tool bits are available in



Using Rexalloy Tool Bits in a turret lathe to machine hard gray iron castings. Depth of cut, ¼ in.; speed, 270 s.f.p.m.; feed, 0.010 in. Pieces per grind, 25.

sizes of ¼, 5/16, 3/8, 7/16, ½, 5/8, and ¾ in. wide varying from 2⅛ to 5 in. in length. Other sizes and lengths are available upon request.

Rotor "Power-Plus" Grinders

The Rotor Tool Company, 17325 Euclid Ave., Cleveland, Ohio, announces four "Power-Plus" Air Grinders, comprising a completely new line built around the

IT STARTED IN THE AIRCRAFT INDUSTRY WITH CYLINDER STUDS!

How grinding is top ranking production method for generating threaded parts

HOW can we put better, stronger threads on our highly stressed cylinder studs? That was the cry of the aircraft industry only a few years ago. They had already reached the absolute limit of accuracy and dependability in generating threaded sections by the old methods.

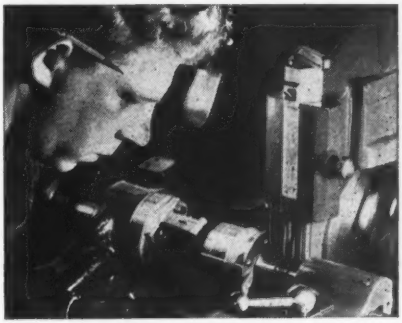
The answer was thread grinding! With the introduction of accurate and efficient machines in 1935, it became possible for the first time to generate cylinder stud screw threads from the blank by grinding . . . on a production basis. Previous to this, thread grinding had been an obscure process used only for the correction of screw threads.

The result of grinding the cylinder stud threads was a vast improvement in accuracy and dependability . . . at a surprisingly low cost. The new method was so sensationally successful that its use was soon extended by aircraft manufacturers to practically all threads on external surfaces, and to internal surfaces where size would permit.

Manufacturers in other fields were not slow to fall in line. They have eagerly adopted thread grinding and made it one of the top ranking production methods for generating threads of all kinds . . . in a wide variety of materials . . . for almost every conceivable purpose.

Correct grinding wheels necessary for best results

As in all precision grinding, the use of the right wheel is of paramount importance in thread grinding. Even before the appearance on the market of thread grinding machines for production work, Carborundum had discovered and introduced the modern types of specially bonded thread grinding wheels. This availability of suitable wheels had a great deal to do with the immediate success of thread grinding on a production basis.



Thread grinding is simple. Accurate results are secured without experienced operators.

Adequate stocks of uniform, high-quality Carborundum-made thread grinding wheels are carried at all times, to meet every thread grinding requirement from 2 to 80 threads per inch.

Inquiries will be welcomed at any office of The Carborundum Company.

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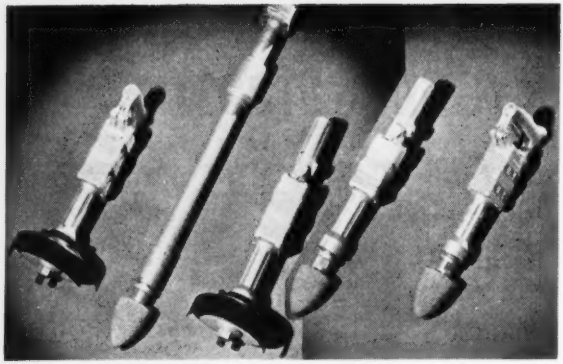

Rotor "Power-Plus" Grinders Types (Left to Right) D-100 Grinder with Spade Handle, D-100 Grinder with Straight Handle, D-100 Extension Grinder with Cone, D-75 Cone Grinder with Straight Handle, D-75 Cone Grinder with Spade Handle.

new "Power-Plus" twin cylinder air motor. The Power-Plus air motor is of the external blade type which was a development of The Rotor Tool Company. The line includes the D-75 for cone and 4-in. wheels, the D-80 for 4 and 6-in. wheels, the D-100 for heavy duty 6-in. wheels including 13 and 26-in. extensions, and the D-300 for heavy duty 8-in. wheels.

The manufacturer claims unusual power in these machines plus the following features: High speed under load which provides fast metal removal and reduces wheel cost. Unusually light weight, providing ease of operation. The heavy duty 6-in. grinder, D-100, weighs only 9¾ lbs. Low air consumption, reducing power costs. Low maintenance due to the twin cylinder construction. Blades may be removed by removing the cover plate and without disassembly of the entire tool. For thorough cleaning the tool can be completely taken down by removing the four through bolts. Safety through the new multi-port governor which operates irrespective of the varying air pressures, holding the free speed to the allowed speed of the safety code. However, the governor quickly opens under load, providing ample power under working conditions.

Rotor "Power-Plus" Grinders are available with three types of handles; straight, spade, or safety straight. In addition to the construction features which the manufacturer claims will reduce maintenance costs, attention is called to the interchangeability of repair parts in the complete line of four machines, such parts as front handles, rear handles, center bearing section, end plates, and so on, being interchangeable. The parts which comprise the difference between the machines are parts which seldom need replacements. This feature of interchangeability will reduce repair stocks necessary and cost of maintenance for manufacturers operating 2¾, 4, 6, and 8-in. grinders.

"Torq" Drive Unit

The motor drive unit illustrated is one of a series manufactured by The Torq Electric Mfg. Co., 6609 Carnegie Ave., Cleveland, Ohio, for motorizing machine tools. Built in a range of sizes from 1

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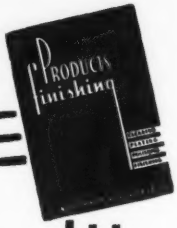

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② SUPER SMOOTH POLISHED FINISH.
③ CLOSE TOLERANCE—ACCURATE BALANCE.
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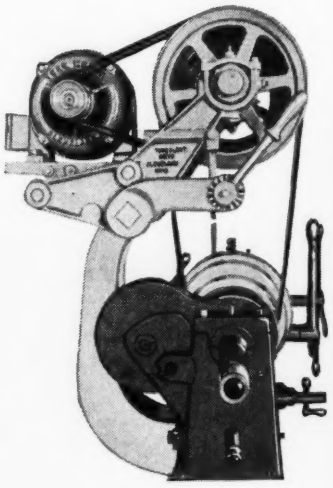
THE CINCINNATI BALL CRANK CO.
CINCINNATI, OHIO * * * U. S. A.

to 10 h.p., the unit employs many features which are said to make the drive exceptionally versatile and sturdy.

The side frame is rigidly supported by an all-welded steel column. A variable belt tension device enables the operator to shift the belt by movement of a conveniently located lever and also permits any degree of belt tension desired. The countershaft is mounted on ball bearings sealed in self-aligning housings. The bearing housings are of liberal design to allow for an ample supply of grease.



"Torq" Drive Unit

The drive can be supplied completely assembled with or without Torq electric motors. The motor support rails on the unit are uniform and will fit practically any motor within the horsepower and speed range of the drive ordered.

Kent-Owens No. 1-M Hand Miller

The No. 1-M Hand Miller now offered by Kent-Owens Machine Company, 958 Wall St., Toledo, Ohio, is said to be a distinct departure from conventional hand miller design in that it provides many advantages not hitherto available in machines of this class. Among these

is a twin post construction to carry the head with spindle location midway between the posts. The cylindrical post construction provides an ideal bearing for the head and eliminates the possibility of cocking action or tendency to chatter.

The entire head is counterbalanced so that its weight and the weight of the tooling offer practically no resistance in feeding the head. The counterbalance can be adjusted to compensate for any changes in weight due to tooling, overarm, or pendant. The twin post construction further materially simplifies the machine drive, only two gear contacts being necessary between the motor and spindle. No belts, idlers, or belt guards are required.

The 9 x 25-in. table is located at a convenient working height and has a total movement of 12 in. The table is fed 4¾ in. for each 180 deg. of lever movement. The elimination of both saddle and knee increases the rigidity of the entire assembly and eliminates any tendency toward vibration. Three T-slots in the table facilitate set-up. The spindle—No. 30 National Standard nose and taper—is mounted on two pre-

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50 Inch Swing Takes Most Any Job!

Here's a machine that fills a big gap in the industry. With its 50-inch swing it will do the work of far more costly lathes. Standard equipment includes reversible water pump and 6-foot bed. Any size bed can be provided on order. Hand scraped ways and base plus quality construction throughout. Write Dep't. 1-D for catalog.

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General Internal Grinding
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Turning
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Surface and Face Grinding
Large and Small Connecting Rods
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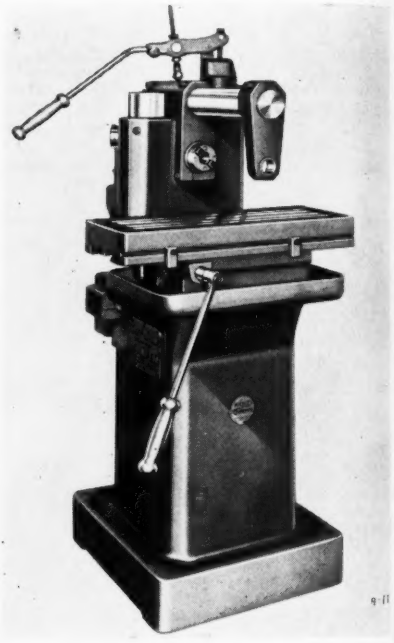
cision taper roller bearings and a preloaded ball bearing at the rear, all running in oil.

Speed changes are made by means of pick-off gears at the rear of the head. Speeds of 100 to 1,335 r.p.m. are available with a 1,200 r.p.m. motor, while a maximum of 2,000 r.p.m. may be obtained with an 1,800 r.p.m. motor. The distance from table to center of spindle ranges from 1 in. minimum to 8 in. maximum. The maximum movement of the head is 4 in., which may be obtained anywhere within the total range of head movement, which is 7 in. Maximum distance from center line of table to spindle nose is 5 in. The compact design of this machine has reduced the required floor area and overall working area to 20 x 21½ in.



Kent-Owens No. 1-M Hand Miller

Net weight of the machine, including motor and electrical equipment, 950 pounds.

A 4½-gal. coolant tank is located in the base and the coolant pump is

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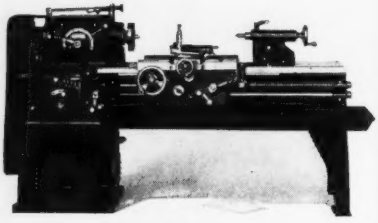
"C & J"

15" and 16" Lathes



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The Carroll & Jamieson Machine Tool Co.
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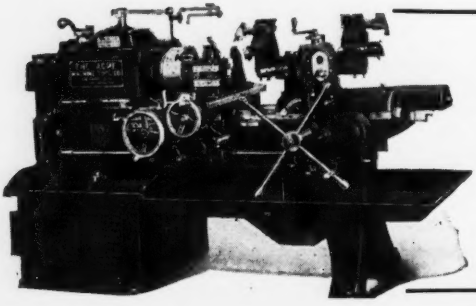
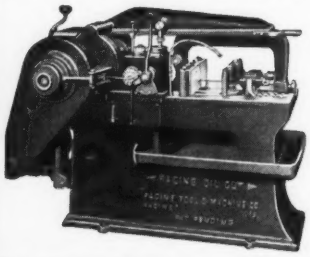


Cincinnati Acme
Universal Turret Lathes

The No. 4W Acme Universal Turret Lathe with its unusual high operating efficiency and simplified design, insures maximum production on all work within range. Write for circular.

THE ACME MACHINE TOOL COMPANY
CINCINNATI • OHIO

RACINE
METAL CUTTING POWER SAWS



A fast accurate power saw, with modern hydraulic feed and control. For production and all purpose work—6" x 6". Moderately priced.

Most complete line—Heavy Duty Hydraulic Machines—Screw Feed and Hydraulic Production Saws—RACINE Utility Saws of New Design.

WRITE FOR BULLETINS

RACINE TOOL & MACHINE CO.
1770 State St. Racine, Wis.

Why Use A Shaper
to cut Keyways when a

DAVIS KEYSEATER will do the job so much quicker and better?

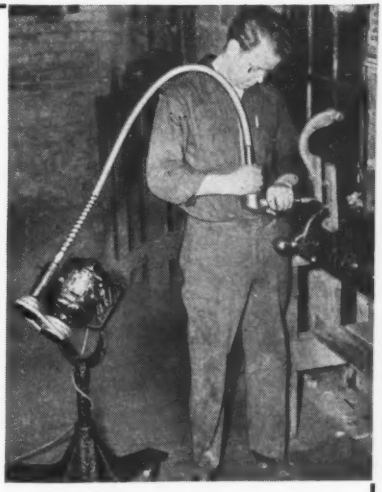
Send for Circular

DAVIS KEYSEATER CO.
Exchange and Glasgow Sts.
ROCHESTER, N. Y.

STOW FLEXIBLE SHAFTS and TOOLS ARE PROVED
IN ACTION!

Take a Stow Flexible Shaft unit. Use it anywhere in the plant. All purpose units moved quickly with interchangeable tools. Sturdy units for year after year top-notch service grinding, polishing, drilling, wire-brushing. 10 mountings, high or low speed, 1/8 to 10 H.P.

SEND FOR CATALOGUE 38
Inventors Flexible Shafts 1875

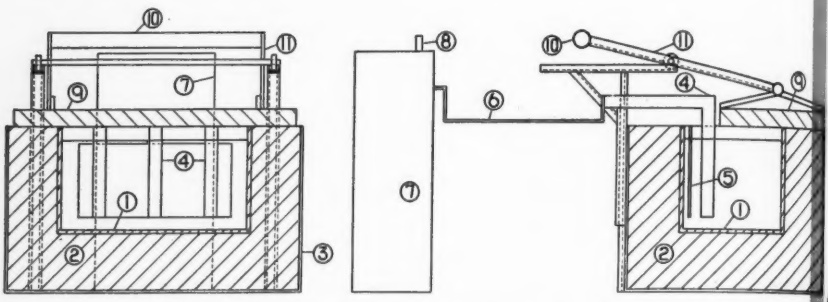


STOW MFG. CO. Inc.
1 SHEAR ST. BINGHAMTON, N. Y.

mounted at the side of the machine with both intake and delivery passages self-contained in the machine casting. There is no piping except the delivery nozzle at the cutter.

rate in change in chemistry of bath materials.

3. A new type of cover which permits loading or unloading from either front or sides.



Holden Three-Phase Electrode Furnace

Holden Three-Phase Electrode Furnace

The drawing herewith presents the construction characteristics of a three-phase electrode furnace which has been developed by The A. F. Holden Company, New Haven, Conn. The design is said to include the following features:

1. Method of construction which prevents current passing to the pot wall. The user is assured that no heat is generated in the rear wall of the pot, thus there will be no warpage of the pot wall toward the electrodes and pot life will be longer.

2. The three-phase unit provides for the use of electrodes in sets of three. Current density of the electrodes is 50 per cent lower than electrodes arranged in pairs. Advantages consist in doubling the electrode life and in the low

Parts indicated by the numbers in the drawing are as follows: (1) metal pot, (2) heat insulation, (3) furnace shell, (4) electrodes, (5) baffle plate, (6) bus bar connection between electrodes and transformer, (7) transformer, (8) tap changing plug, (9) cover, (10) counterweight, and (11) cover suspension.

Magnilite

The Magnilite illustrated herewith has been especially designed by the manufacturer—Mizzy, Inc., 105 E. 16th St., New York, N. Y., for tool and die makers and machinists. The device is said to be a practical solution for many inspection problems in industrial plants because it can be detached from the stand and used in any position.

The Magnilite concentrates pure daylight rays on the object being inspected

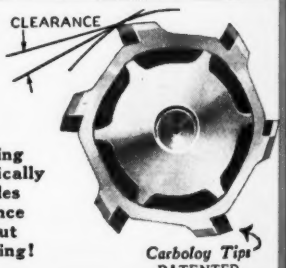
No Other Reamer Saves You This!

Staples reamer eliminates regrinds after re-sizing. Provides *parallel* and *equal* outward expansion of tips, free cutting action and long life. One plant reamed 105,000 cylinders without regrind. Write for leaflet. Sold thru Carboloy Co., or direct from—

STAPLES TOOL & ENGINEERING CO.
Cincinnati, Ohio

STAPLES

Re-sizing Automatically Provides Clearance Without Regrinding!



Carboloy Tips PATENTED.

LAPPED and POLISHED
DIAMOND
BORING and TURNING
TOOLS

"V" Point

Offset

• For boring and turning all non-ferrous metals, bakelite, hard rubber, etc. Strong and keen cutting. Guaranteed to perform satisfactorily.

Write for prices and recommendations.

WHEEL TRUEING TOOL CO., Inc.
13931 OAKLAND AVE. • DETROIT, MICH.

New
ABRASIVE
BELT SURFACER

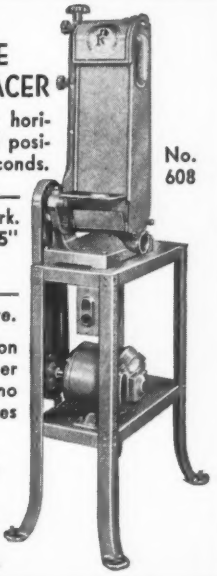
Adjustable from horizontal to vertical position in a few seconds.

Handy, compact—for production work. Work table — 15" long x 6" wide.

Surface speed — 2300 ft. per minute.

Exhaust connection for vacuum cleaner bag. No dust—no dirt. Other sizes and types.

Write for folder.



No. 608

PRODUCTION MACHINE CO.
Greenfield, Mass.

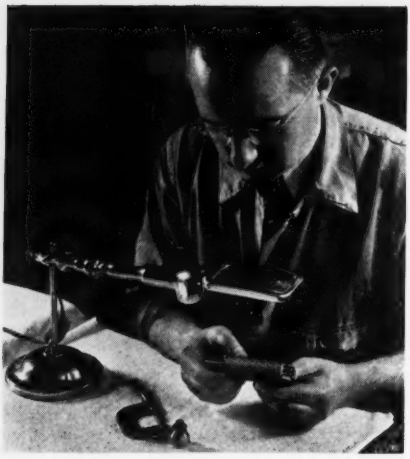
Save time, labor and mistakes — the CERROMATRIX way

Are you still locating punches in dies by costly "fitting and filing" methods? Still using drive fits in anchoring machine parts? Better look into the savings made in many shops with CERROMATRIX, the low-temperature-melting alloy that expands slightly on solidifying. For example, five ounces of Cerromatrix saved nine hours in locating the irregular punch in the blanking die shown here.

Send for booklet

Photograph by courtesy of Ranco, Inc., Columbus, O.

CERRO DE PASCO COPPER CORPORATION
44 WALL ST. NEW YORK, N. Y.
British Associates: Mining & Chemical Products Ltd., London, Eng.
Canadian Representatives: Dominion Merchants Ltd., Montreal, Can.



Magnilite

which, in turn, is viewed under magnification from above. It is claimed that through the use of the Magnilite, inspection efficiency is substantially increased, caliper readings are more easily determined, and eye strain is eliminated. The Magnilite is attached to the base on a universal joint, permitting adjustment to any desired position.

Lincoln Small Arc Welder with Self-Indicating Dual Continuous Control

A small motor-generator type arc welder, said to provide greater convenience and accuracy in welding because of a new self-indicating dual continuous current control, is announced by The Lincoln Electric Company, Cleveland, Ohio. The unit is intended to widen the application of welding in such fields as garages, sheet metal shops, maintenance departments of pulp and paper mills, cement plants, textile plants, gas plants, and similar plants as well as metal fabricating shops.

The welder, known as "SA-150" has both job selector and current control calibrated and equipped with dials which indicate the type of work and number of amperes for each setting. It is claimed that this development enables the operator to secure highest

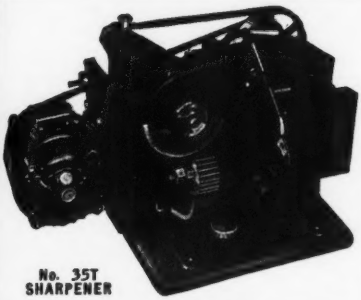
SHELDON Back Geared Screw Cutting PRECISION LATHES

NO. 1124-WFCQ
With Headstock Motor Driven Attachment
11" Swing, 56" Bed, 1 1/16" Hole Thru Spindle, 3/4" Collet Capacity, Worm Feed Apron with Power Cross Feed, Full Quick Change Gear Box, Thread Chasing Dial, Floor Legs and Overhead Motor Drive Attachment complete (less motor)
F.O.B. Factory **$340.00**

TODAY it is possible to buy quality industrial lathes at a moderate price—10", 11" or 12" SHELDON Back Geared Precision Screw Cutting Lathes, with full weight heavily braced semi-steel beds, large hardened and ground spindles. Phosphorus bronze bearing, extra collet capacity, and hand scraped ways (2 V-ways and 2 flat ways).

Under the SHELDON Set-up you can get exactly the features, attachments and accessories wanted — an exactly suited bench, floor or pedestal base lathe for your individual need.

SHELDON MACHINE CO., Inc.
1626 North Kilbourn Ave.
CHICAGO, ILL., U. S. A.



No. 35T SHARPENER

AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

Up to 5½" diameter and up to 1¼" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

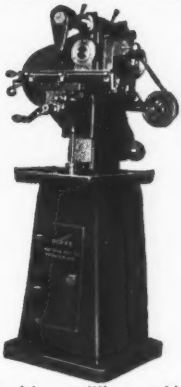
The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

WRITE FOR CIRCULAR

THE WARDWELL MFG. CO.

3166 Fulton Rd. Cleveland, O.

BURKE Milling Machines



Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

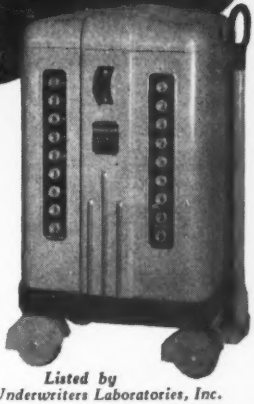
BURKE MACHINE TOOL CO.

297 E. 16TH ST. CONNEAUT, OHIO

WANT TO KNOW WHY—

MARQUETTE A.C. ARC WELDER

is the FASTEST SELLING A.C. ARC WELDER on the Market?



BECAUSE A. C. arc welding quickly and inexpensively repairs and fabricates expensive metal parts . . . it more than pays for itself out of savings.

BECAUSE with a little practice, anyone can satisfactorily operate the Marquette, producing strong, dense ductile welds.

BECAUSE there are five Marquette models at five prices $155, $195, $225, $242.50 and $498.00 . . . a size and price to fit your needs.

For complete details write Dept. E.

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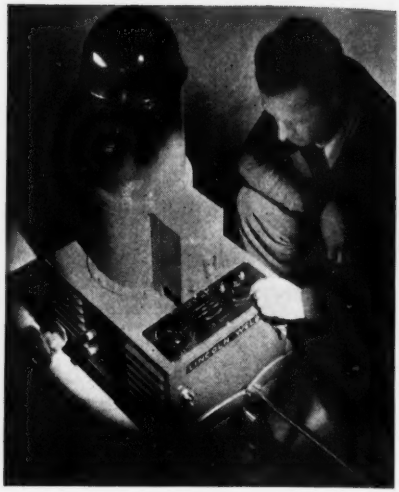
MARQUETTE MANUFACTURING CO., Inc. MINNEAPOLIS MINNESOTA

quality welds and highest possible welding speeds because he can vary both the slope of the volt-ampere curve and the amount of welding current independently and positively to suit each job encountered. Both voltage control (job selector), and current control are continuous in operation, providing countless possible combinations of voltage and current. According to the manufacturer, this feature simplifies the setting of the control and accounts for an exceptionally wide welding range as to types of work, welding conditions, sizes of electrodes, and thicknesses of materials.

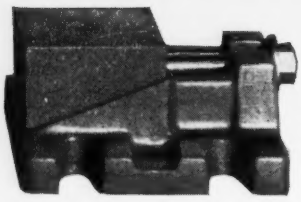


Lincoln Small Arc Welder with Self-Indicating Dual Continuous Control

The "SA-150" is powered with a "Linc-Weld" squirrel-cage induction type motor for across-the-line starting. Connections are readily accessible for 220 or 440 volts, three or two phase, 60 or 50 cycles as desired. The machine can be supplied for 550 volts or special voltages. Construction is arc welded drip-proof steel. Floor space occupied is less than 4 square feet.

Grobet Rotary Files

A line of ground-from-the-solid rotary files has been added to the line of files marketed by the Grobet File Corp. of America, 3 Park Place, New York, N. Y.



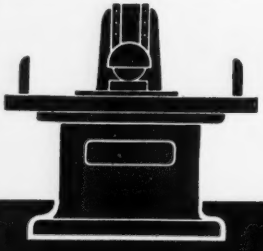
Profitable, accurate production demands level machinery. Save tools, time and money. Write for details on precision jacks; three standard sizes.

BAKER BROTHERS, Inc.
Toledo, Ohio

New Jersey Office,
1060 BROAD ST., NEWARK

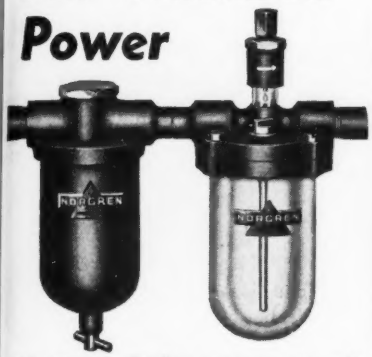
★

BAKER



ABRASIVE
Surface Grinders
QUALITY · ACCURACY · DURABILITY · ECONOMY
WRITE FOR PARTICULARS
ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE, R. I.

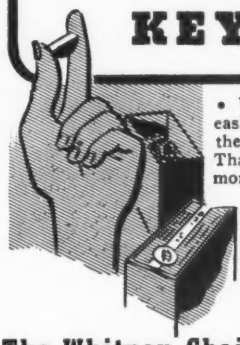
For Vitalized Power



This Norgren Vitalizer removes scale, grit and practically all the moisture from the air stream and then automatically lubricates it with an oil fog. The result is cleaned, oiled power for air tools. Write for specifications, sizes and prices.

C. A. NORGREN CO., INC.
216 Santa Fe Drive Denver, Colo.

Quicker assembly . . .
Lower cost with
WHITNEY
Woodruff
KEYS



• Whitney keys are easily fitted — because they're accurately made. That means time-saving, money-saving assembly of shaft and keyed member. Yet Whitney keys reach deep in the shaft, stand greater strain, can't roll over. Write for Catalog V-111 and price list.

The Whitney Chain & Mfg. Co.
HARTFORD • CONNECTICUT

FOR EVERY METAL CUTTING JOB

Buy

"HIGH-SPEED" "MO-SPEED" "TUNGSTEN" "SUPER-FLEX"

Buy
"the Blades in the Plaid Box"

Sold by distributors everywhere

American Saw & Mfg. Co. • Springfield, Mass.

These rotary files are said to be made from a superior grade of high speed steel and are ground from the solid after

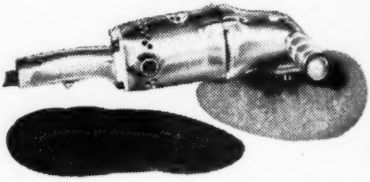
Grobet Rotary File

hardening. The outstanding advantage of these files consists in that they can be resharpened many times at a very low cost.

Van Dorn Combination Sander-Buffer

The Van Dorn Electric Tool Company, 720 Joppa Rd., Towson, Md., has announced to the trade a Combination Sander-Buffer which is considerably lighter, shorter, and better balanced than previous models. Many mechanical features have been incorporated, such as a dust-proof rocker type switch and reversible side handle for either right or left hand operation.

For the handling of a variety of sanding, buffing, and cleaning jobs in shops, buildings, and for general maintenance where intermittent service is required, the Combination Sander-Buffer is said to be a "natural." It is equipped with two sets of double gears and a transmission gear which is easily shifted from one to the other to provide either high or low spindle speed. The patented gear locking pin in the gear housing locks the gears for the changing of pads and discs.



Van Dorn Combination Sander-Buffer

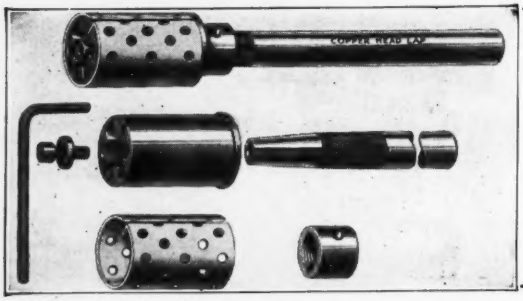
The high spindle speed of 3,700 r.p.m. is correct for 7-in. sanding operations, and the low speed of 1,400 r.p.m. is

ILLINOIS G & M COMPANY

Gears for Every Purpose

The most approved type of equipment and skilled craftsmen of our large modern works ensures you of a complete gear service of highest quality. You can always depend upon prompt deliveries.

ILLINOIS GEAR and MACHINE CO.
2106 N. NATCHEZ AVE. CHICAGO



LOWER YOUR LAPPING COSTS

With Copper Head Expansion Laps. Profitably used in hundreds of leading shops. Available in sizes from ⅛" to 2½", graduated by sixteenths of an inch.

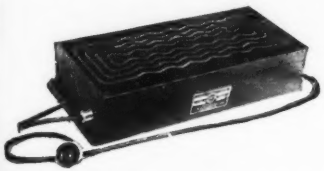
Many other designs for special applications.

Write for Bulletin

Boyar-Schultz Corporation
2120 Walnut St. Chicago, Ill.

"NEW D & W" MAGNETIC CHUCKS

Styles 7 x 17 and 6 x 13



Developed to meet demand for chucks lower than our standard style.

Send for folder covering Chucks and Demagnetizers.

J. & H. ELECTRIC CO.
202 Richmond St. Providence, R. I.

No Mushrooming ▶
No Chipping ▶
Oversize Shanks ▶
Exclusive Knurled Back ▶
Exclusive Thumb Grip ▶
Broach-Rounded Corners ▶

and a complete line of Marking Devices

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NEW METHOD STEEL STAMPS, Inc.
149 Joseph Campau, Detroit

Small Tools...

Long Length Drills
Special Size Taps
Carried in Stock

High speed and carbon drills, taps, reamers, milling cutters, hollow mills, end mills, drill rod, die sets, etc. . . .

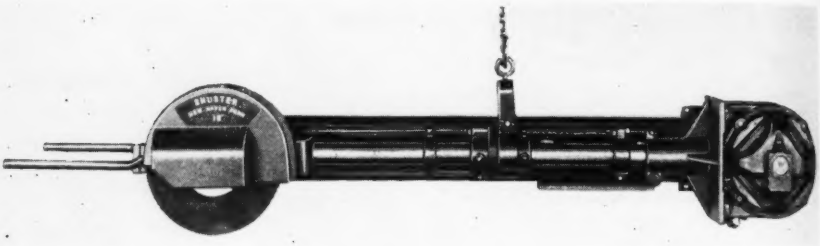
Send for New 1939 Catalog

VICTOR MACHINERY EXCHANGE
(INCORPORATED)
251 CENTER ST. NEW YORK CITY

correct for buffing. The change in the gear ratio for the low spindle speed also increases the torque, which is valuable in rubbing down lacquer and paint.

Shuster Motor Driven Swing Frame Grinder

The motor driven, suspended type, swing frame grinder shown in the illustration is a recent development of The



Shuster Motor Driven Swing Frame Grinder

F. B. Shuster Company, New Haven, Conn. The grinder is intended for heavy grinding work, such as castings, cleaning up steel billets, and polishing sheet material. Three sizes are available, the smallest mounting a grinding wheel 16 in. in diameter by 3 in. wide, and the largest accommodating a 24 x 3-in. wheel.

The range of motors is from 5 to 15 h.p. and the drive is through V-belts. The driving motors may be of the standard totally enclosed, dust-proof, alternating or direct current type.

The machine is supported by a swiveling yoke and can be swung through a complete circle. In addition, it may be tilted so that the wheel spindle is inclined at angles up to 90 deg. to the horizontal. A clamping attachment actuated from the operating position permits locking the machine at the required angle of tilt, and the balance is maintained in all positions. The driving belt has a strong sheet steel guard. The grinding wheel runs on fully enclosed heavy duty ball bearings which are readily accessible for replacement.

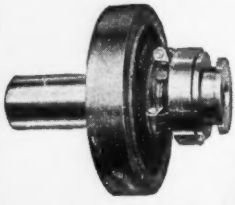
The smallest machine, with 5 ft. 5 in. centers, has an overall length of 96 in., including the handles, and a width of 22 in. It weighs approximately 700 lbs. with an alternating current motor, and 800 lbs. with a direct current motor.

Ames Nos. 3500, 5500, 5700, and 9900 Dial Indicators

B. C. Ames Co., Waltham, Mass., has brought out four dial indicators, identical in design but of varying sizes, which are said to be accurate to 0.000025 in. and sensitive to 0.000010 in., with 0.020 in. spindle travel. It is said that the indicators have an error not greater than one-quarter ten-thousandth plus or

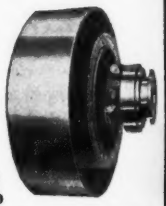
"EDGEMONT" SERVICE TESTED FRICTION CLUTCHES

Disc "Type SF"



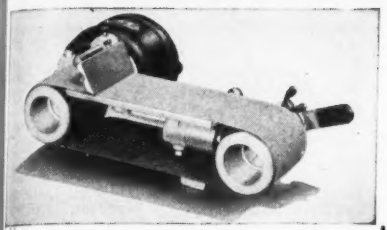
A dependable, trouble-free clutch, built for high standards of performance. Made in clutch pulleys, extended sleeves, and cut-off couplings. For machine applications, countershafts, and line-shafts the Edgemont "Type SF" Disc Clutch is outstanding for efficient service.

Write now for circular and data.



The Edgemont Machine Co.

2100 Home Avenue Dayton, Ohio



NEW An Inexpensive ABRASIVE BAND GRINDER..

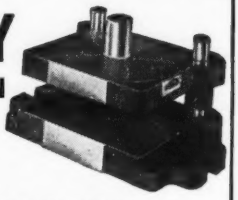
"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER
WALLS SALES CORP.
96 WARREN ST. NEW YORK, N. Y.

DANLY PRECISION DIE SETS



Danly All-Steel Sets
Danly Commercial Sets
Danly Die Makers' Supplies

DANLY SERVICE

8 Danly Warehouses Provide 24-Hour Service for 85% of All Metal Fabricating Plants

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Long Island City, N. Y., 36-12 34th Street
Dayton, Ohio, 990 E. Monument Avenue
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DANLY DIE MAKERS' SUPPLIES

EASY - To Load - To Empty - To Handle

"RB"

HEAVY DUTY SHOP BOX

Designed for handling extra heavy loads, this open end stacking box is ideal for the transportation of small parts from one operation to the next. Also a practical unit for regular stock storage. Stacking rail on two sides and rear of box hold loaded boxes together in a rigid stack. Front cross member holds top front of box in perfect alignment and serves as a convenient strong and easily gripped handle. Open hopper end permits the quick, easy removal or loading of material from any one box without loss of time in dismantling the stack. Mail coupon for prices and full particulars.

LYON METAL PRODUCTS INCORPORATED
1306 River Street
Aurora • Illinois

LYON METAL PRODUCTS, INCORPORATED
1306 River Street, Aurora, Illinois

Please send prices and data on Style "RB" Open Hopper End Shop Box.

Name .....
Address .....
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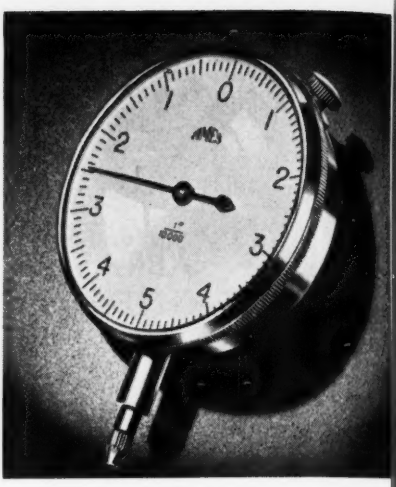
minus and it is claimed that there is no drag or lag in the movement of the hand in relation to the movement of the spindle.

To obtain this accuracy the teeth of the gears are milled with three cuts on special automatic machines by which process a perfect involute tooth form is said to be generated. The gears are then hardened and ground to assure accuracy and long life. Rigid supports for the hardened and ground staffs are attached to thick plates. Jewel bearings for each staff have olive holes and the staffs end-shake against them. The



Ames Nos. 3500, 5500, 5700, or 9900 Dial Indicator

plates also support patented wire-attached bezels. Contact points have carbide tips to reduce the possibility of wear to the minimum. The mechanism is housed in thick section cases that are machined all over and the stems can easily be replaced when worn or damaged.

The No. 3500 is 1½-in. diameter over the dial; No. 5500 is 2⅛-in. diameter; No. 9900 is 2¾-in. diameter, and No. 5700 is 3⅝-in. diameter. The instruments are chromium plated throughout.

Roller Bearing Stackrack

Stackbin Corporation, 53 Troy St., Providence, R. I., is now marketing a

NEAT STAMPING in NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

Write for Particulars

GEO. T. SCHMIDT, Inc.

1806 Belle Plaine Ave. Chicago, Ill.

WALKER Universal Swivelling Magnetic Chucks

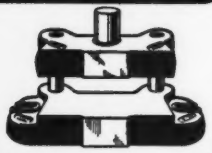
Three sizes of swivelling chucks with or without vernier adjustment. Magnetic surfaces—4"x10", 4"x20" and 4"x30".

Eliminate slow-acting jigs and fixtures—change set-up time to production time.

Write for catalog W3.

O. S. WALKER CO., Inc. WORCESTER, MASS.

BAUMBACH



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DIE SETS

Steel | Semi-Steel

DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, a listing of more than 185,000 stock sizes and 46 different styles afford a service that is unsurpassed.

Send for Our New 288-Page Catalog

E. A. BAUMBACH MFG. CO.

1806 S. Kilbourne Ave. Chicago, Ill.

CYLINDRICAL SUB-PRESSES

Have several advantages. Alignment is easily obtained and maintained. For circular punches and dies they are particularly economical and for irregular shapes they can be handled as conveniently as other types. Our Booklet on Sub-Presses and Dies shows when they should be used. Ask for it.

ARCH TYPE

Waltham Machine Works

WALTHAM, MASS.

Modern Mule with Powerful Pull has Rockford Spring-Loaded Clutch

Plenty of "pull" in the Shop Mule Tractor, illustrated, and a Rockford Spring-Loaded Clutch figures importantly in its reliable performance . . . gives smooth, easy engagement, and durable, efficient power transmission control for frequent stop-and-go operation in congested areas of factories, yards, terminals.

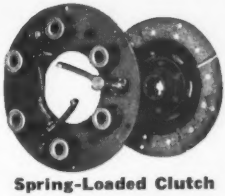
Rockford Clutches are made in two types; are generally interchangeable; fit machine designs readily . . . Spring-Loaded operates like an automobile clutch; O-C (Over-Center) locks in or out of engagement until changed by operator. Accurately made, compact, durable, Rockford Clutches save money, build reputations. Investigate.

Rockford Drilling Machine Division

of Borg-Warner Corporation

200 Catherine Street, Rockford, Illinois

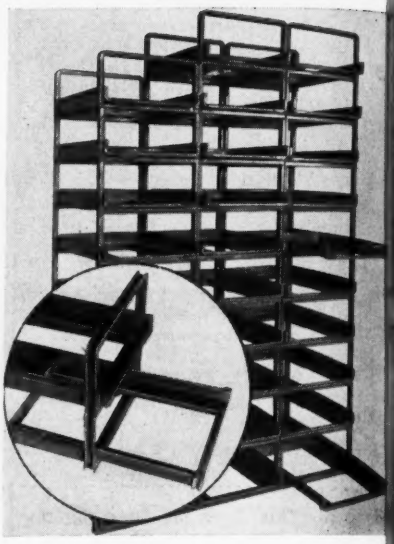
Unexcelled for drives from internal combustion engines, Rockford O-C and Spring-Loaded Clutches are built with single or double drive plates, for oil or dry operation, in capacities up to 80 h.p. at 100 r.p.m.



Spring-Loaded Clutch

Stackrack built of interlocking units of channel and formed steel which can be set up to form box storage racks of any height, size, or capacity. A roller bearing slide upon which boxes slide in and out of the rack with a very slight pull, makes the handling of heavily loaded boxes easy and safe.

The roller bearings fit into the channel steel of the slide in such way that the sliding motion of the box is restricted to half its length, which is enough to permit ready access to the box contents. The upper surfaces of the slides are made smooth for easy operation of the roller bearings.



Roller Bearing Stackrack

The Roller Bearing Stackrack is designed particularly for plants where heavy stock and parts stored in boxes must be readily accessible, and is made in sizes to fit the boxes or pans in use in any plant.

Hartford Triple-Action Cutting Barrel

The illustration shows a motor-driven cutting barrel for use in cutting down, wet and dry grinding, tumbling, pulverizing, and mixing which has been placed on the market by The Hartford Steel

SMALL GEARS

—in the finer Pitches—14 to 96 D. P.

SPURS WORM-
SPIRALS GEARING
HELICALS RACKS
BEVELS RATCHETS

High precision or commercial production. A few pieces or a million.

You can SAFELY entrust your Gear purchases to this exceptionally well equipped and organized plant.

Made to order Only—No stock—No Catalog

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HEAVY AUTOM DUTY
Continuous Hinge No. 290

A Heavy Hinge For Heavy Duty
Stocked in 7 foot lengths, 3" and 5" when wide open.
Special lengths and widths to order.
For details write:
Auto Moulding & Mfg. Co.
HINGE DIV.
2326 S. Canal St.
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MORE "STAMP MILEAGE" From THOR STAMPS

You get clear, uniform marks for a long time from Thor Stamps. More marks per dollar. • Correctly-heated special alloy steel—Central striking point—Thumb side marking.

WRITE FOR CATALOG

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812 CANAL ST. • PITTSBURGH, PA.

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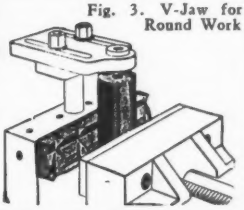
VISE

With and Without Jig Attachments 6", 9" and 12" Jaws

All Vises are drilled to take Jig Attachments. Attachments mean much drilling—small Jig cost.

Send for Circulars

Fig. 3. V-Jaw for Round Work



THE GRAHAM MFG. CO., 69 Willard Ave., PROVIDENCE, R. I.

BEST VALUES on the MARKET

10½ Full Universal Dividing Head

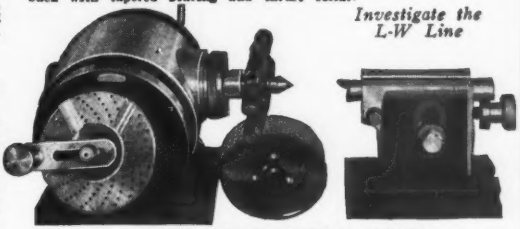
Index Centers for Universal Milling Machines

Can be furnished right or left hand. Actual swing 11". $170.00

For all kinds of indexing and spiral cutting. Swivel head stock is graduated to 180 degrees and can be tilted above and below the perpendicular. Spindle has No. 10 B. & S. taper front and back with tapered bearing and thrust collar.

Investigate the L-W Line

L-W also manufactures magnetic chucks, lathe chucks, demagnetizers, vises and Power Hack Saws. Send for catalog.

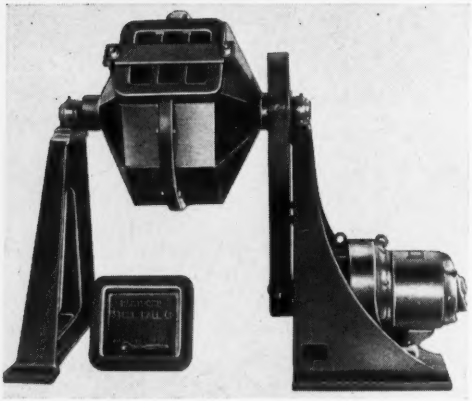


10½ Universal Index Centers

ctual swing 11". Right or left hand. new universal dividing head designed give the utmost in a well-balanced, gid and accurate index center. All maerials and workmanship are of the highst grade. Head stock is swivel and raduated up to 180 degrees. Head can e tilted above and below vertical and erpendicular lines. Spindle has taper earing and is provided with take-up colar for end thrust. No. 10 B. & S. taper has large hole through spindle. **$110.00**

L-W CHUCK CO.

20 N. ST. CLAIR ST. TOLEDO, OHIO



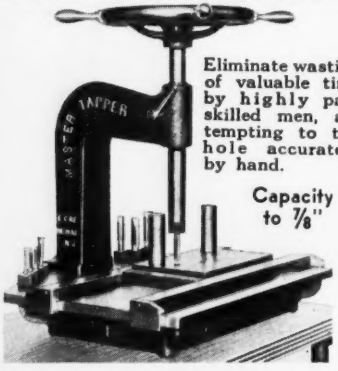
Hartford Triple-Action Cutting Barrel

Ball Co., P. O. Box 146, Station A, Hartford. Conn. The outstanding feature of this type of barrel is in its shape. The construction is said to produce a triple-action in tumbling the material—an "over and over" end to end "folding-in" motion combined which might be compared to the action of the water which flows over a waterfall and churns in from each side to the back-water as it flows up to the head of the pool. This multiple action quickly grinds off burrs and finishes and smooths the general surface of any article in the load. The greatest use for this type of barrel is in wet grinding—usually termed sand rolling (sand and water).

The Hartford barrel shown here is fitted with both a solid and a strainer cover. The solid covers are equipped with automatic pressure relief valves. The barrel body castings are made of a special alloy which is said to ensure long life and rapid cutting action.

The barrel is furnished complete with a built-in U. S. Syncrogear Type G.D., 2 h.p. motor. An automatic magnetic starting switch is included, together with a remote control push button station. The motor drives by roller chain and sprocket which is completely protected with a shield. Hartford Triple-Action Cutting Barrels are recommended for the finishing of parts for casters, ball bearings, screw machine

Precision Tool Room Tapping
SAVES
TIME - TAPS - TROUBLE

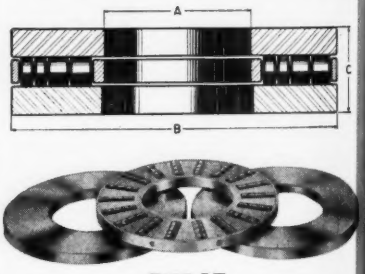


Eliminate wasting of valuable time by highly paid skilled men, attempting to tap hole accurately by hand.

Capacity to 7/8"

The Master Tapper Co.
4 Main St. • Belleville, N. J.

GWILLIAM



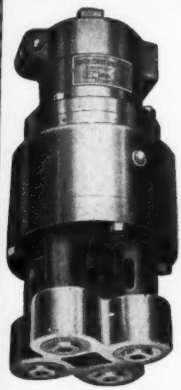
TYPE RT

ROLLER THRUST BEARINGS

• Made with flat seats and in a variety of self-aligning types.
These bearings are especially adapted for *heavy loads* at slow or moderate speeds.

Standard sizes are shown in our general catalog, sent upon request.

THE GWILLIAM CO.
358 FURMAN ST., BROOKLYN, N. Y.



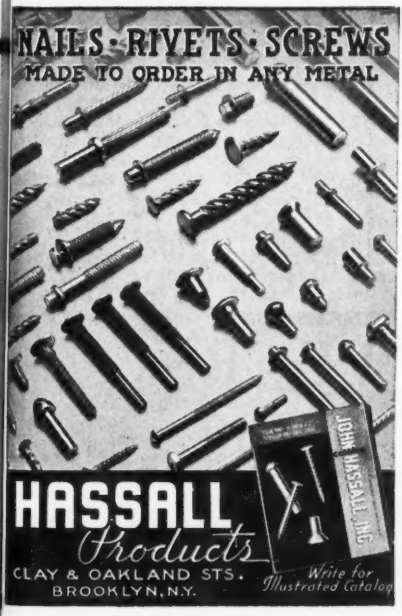
MULTIPLE UNITS

from single drills

U. S.

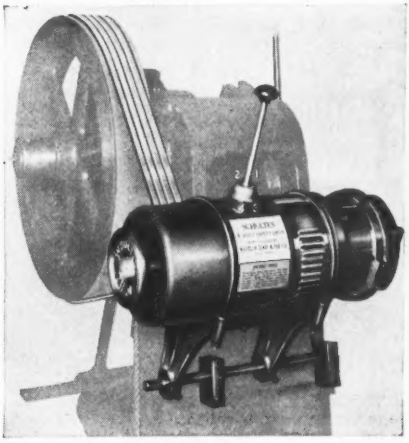
• U. S. Multiple Drill Head Units quickly convert any single spindle drill into a multiple unit. Thus, you are assured more holes per minute and larger profits.
Send blue prints for estimates.

The United States Drill Head Co.
1354 Riverside Drive
CINCINNATI, OHIO



4 SPEED SCHULTES UNIT

Instant Reversibility



Features:

For lathes, shapers, milling machines, drill presses, punch presses, etc.

One lever controls 4 speeds.

Instant reversibility with all 4 speeds.

Adapted to flat-belt, chain or direct drive.

Hand wheel permits rotation of machine spindle for set-up work with complete safety.

Cradle adjustment permits the unit to be revolved to any desired position... placing gear shift lever where most convenient.

Write for illustrated folder

WESTLOF TOOL & DIE CO.
430 BELLEVUE AVE. DETROIT, MICH.

small iron and bronze castings, hardware roller bearings, typewriter and office machine parts, wrenches, airplane parts, locks, link chains, many varied stampings, and so on.

Logan "Two-in-One" Power Chuck

A "dual purpose" power chuck which can quickly and easily be converted into either a two-jaw or three-jaw chuck has been brought out by Logansport Machine Incorporated, 901 Payson Rd., Logansport, Ind. The chuck consists primarily of the standard Logan Three-Jaw Chuck, a fourth jaw being added directly opposite one of the three jaws. By adding the fourth jaw and removing or manipulating two of the three regular jaws, the chuck can quickly be converted into a two-jaw chuck; by removing the fourth jaw and applying two of the regular three jaws, the chuck is converted from a two-jaw to a three-jaw chuck. This construction is intended to save a great deal of time which would otherwise be lost in changing chucks and in many cases makes necessary the use of only one lathe instead of two.

The chuck is made in sizes from 12 in. up with universal, combination, or serrated step-along jaws.

Logan "Two-in-One" Power Chuck

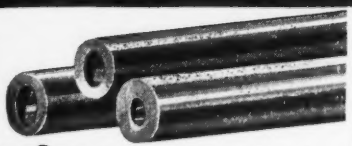
Because of greater strength of tool edge, KENNAMETAL can be used without breakage for interrupted jump cuts as well as for continuous cutting. The cast steel valve stem illustrated has a 3 1/16 in. wide port running straight through, yet is being machined with KENNAMETAL at 200 surface ft. per min., at great savings.

Performance such as this indicates how this new steel cutting tool material may reduce machining costs in your shop. Write for catalog—also the new chart of recommended speeds for cutting steel with KENNAMETAL.

McKENNA METALS Co.
300 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

"OUTWEARS the best Bronze Metal"
20 years ARGUTO without a drink—
ARGUTO OILLESS BEARING CO.
Wayne Junction, Philadelphia, Pa.

SAVE MONEY on BISCO TOOL STEEL TUBING



You Save the cost of drilling rings, bushings, etc., when you order BISCO Tool Steel Tubing. The holes are FREE. Sizes up to 14" diameter.

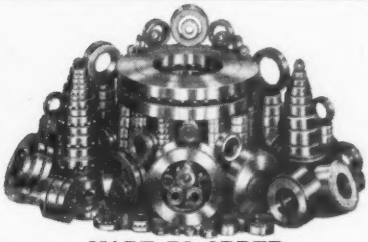
Also: Stainless Tubes, Aircraft Tubes, Mechanical Tubes, Pressure Tubes, Cold Finished Steels, Tool Steels, Special Steels, etc.

The Bissett Steel Co.

Mr. C. O. Watkins
11955 Princetown Ave.
Chicago, Ill.

Mr. Victor Brook
433 Rockingham St.
Rochester, N. Y.

AUBURN
BALL THRUST BEARINGS



MADE TO ORDER

Auburn Special Ball Thrust Bearings are made to customer's dimensions or to answer specified service conditions.
Send details of your problem and get the Auburn Answer.

Write for Catalog.

AUBURN BALL BEARING CO.
69 CLARISSA ST., ROCHESTER, N. Y.

American Swiss Files

of

Precision

SWISS PATTERN FILES

Look for this mark on the tang of a File

Made in the United States

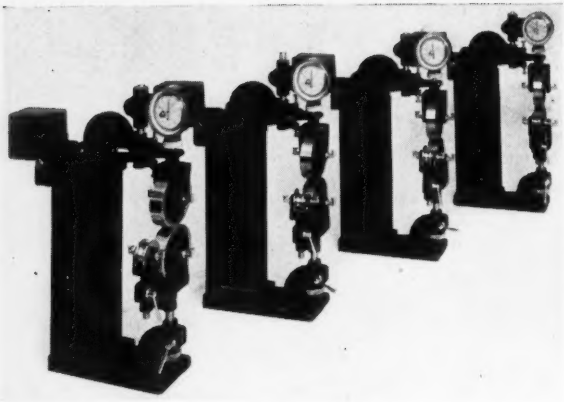
OVER 2,500 DIFFERENT SIZES, SHAPES AND CUTS

There is an American Swiss file to fit the most intricate piece of filing.

ONLY THE BEST

Buy From Distributor

American Swiss File & Tool Co.
ELIZABETH • NEW JERSEY



Federal Model 493B-21 Continuous Measuring Gage

Federal Model 493B-21 Continuous Measuring Gage

The illustration shows a continuous measuring gage for wire or flat material which has been brought out by the Federal Products Corp., 1144 Eddy St., Providence, R. I. The two rollers of the gage are made of hardened steel, and run on precision roller bearings. Rollers of 4-in. size are said to follow material of reasonably smooth surface at a speed of 1,000 ft. per minute. Greater or slower speeds are provided for by means of larger or smaller rollers. The pressure of the upper roller can be adjusted to suit requirements by means of a counterweight provided on the gage.

The indicator of the gage is entirely encased to keep out dust, and is equipped with tolerance hands for easy checking. It is graduated in 0.001 in., and has a range of 0.300 inches.

Work ranging in size from 0.0 to 1¼ in. can be measured by the Federal Continuous Measuring Gage Model 493B-21. This gage is also available in Model 493 — a similar gage which is provided with solid anvils made of hardened steel or tungsten carbide. Either model can be furnished with a floor stand at slight extra cost.

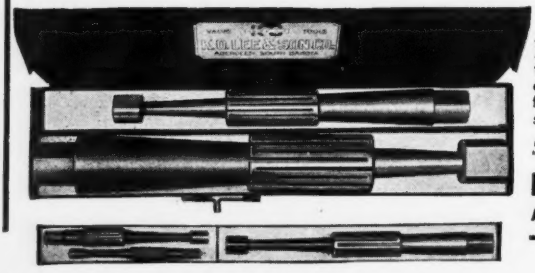
Hisey "Grind-Hog"

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has placed on the market a light weight portable hand grinder to be known as the Hisey "Grind-Hog." The motor of the grinder is of two-

Hisey "Grind-Hog"

pole, polyphase construction which excludes all gears, brushes, commutators, moving wires, or centrifugal switches. The motor has a pull out of approximately 200 per cent of the rated horsepower, and is said to withstand over-

KNOCK-OUT 3/8" to 2½" MANDRELS KNOCK-OUT

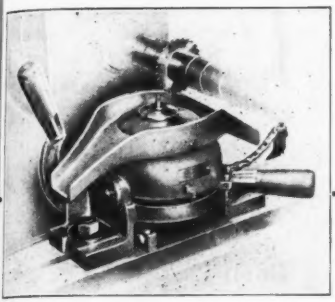


IN ONE SMALL BOX

A set of Knock-Out expanding Mandrels will quickly pay for themselves by saving time and expense making special arbors for each job. Made of tempered steel, accurate within .001".

Send for bulletin No. M38M

K. O. LEE & SON CO.
ABERDEEN • SOUTH DAKOTA



DEARBORN Automatic Chucking and Indexing Fixture

MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN

70 S. CLIFF ST. • ANSONIA, CONN.

No. 455 Angle Iron Combination

Shears, Notches and Bends a 2" x 2" x ¼" angle iron in one minute flat.

Write for catalog on entire line.

No. 20 BALL BEARING PUNCH

Capacity ½" thru ½" iron.

Whitney Metal Tool Co.

110 FORBES ST. ROCKFORD, ILL.

UNIFORMITY

. . . all down the Line

UNBRAKO

Socket Screw PRODUCTS

Fig. 232

Fig. 1434

Fig. 1446

UNIFORMITY OF QUALITY . . . they're all made from high grade alloy steel, properly heat treated. UNIFORMITY OF STRENGTH...tests made in our laboratories and in actual industrial use substantiate this. UNIFORMITY OF MACHINING . . . all "Unbrako" products accurately made to extremely close tolerances.

Fig. 232. "Unbrako" Hollow Set Screw. Points won't mushroom; hex won't round.

Fig. 1434. Knurled "Unbrako" Socket Head Cap Screw. Has knurled grip head that speeds production, permits locking after countersinking. (Pats. Pend.)

Fig. 1446. Knurled "Unbrako" Socket Head Stripper Bolt. Knurled head turns easier; socket head permits compact designs.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA.

Boston Detroit Indianapolis — Box 556 — Chicago St. Louis San Francisco

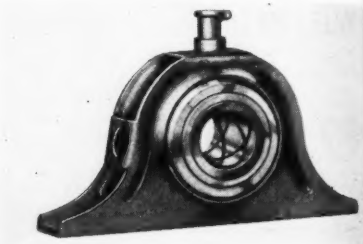
loads for long periods. An inner housing completely encloses the motor and transfers the heat to a cold air duct where it is dissipated by a fan. A husky outer housing protects and carries the motor and bearings.

There are no air cleaners or filters to change or to become clogged. The rotor, the only moving unit, operates on ball bearings which are double sealed against grit and dirt and carry a liberal supply of lubricant. All castings are of special high tensile aluminum alloy with steel inserts forming the bearing seats. The conveniently located switch is quick make and break and of ample capacity, while ground wire affords complete safety.

In addition, the grinding wheel of the unit is provided with a steel plate guard for protection to the operator. The Hisey Grind-Hog operates directly from standard power lines and is supplied complete with a 15-ft. extension cord with ground wire, grinding wheel with wheel nut wrenches, and wheel guard.

Randall Pillow Block

Randall Graphite Products Corporation, 609 W. Lake St., Chicago, Ill., has introduced a light weight, low price



Randall Pillow Block

patented pillow block which appears to be a distinct innovation. The bearing is called the Randall One-Piece Steel Housing Pillow Block. Among its advantages are low assembly cost, a saving of one-third in weight, low price, and low shipping cost. It is interchangeable with all other pillow blocks of the line having the same shaft sizes.

The feature of the block is said to be the quiet bearings and full, constant self-alignment. To cover a range of

Are You "Penny-Wise"?

A small investment in

WALTON TAP EXTRACTORS

will insure against most of the Loss and Delay caused by Broken Taps. No annealing, drilling, or damaged threads.

Ask for Folder 132 listing stock sizes, styles and prices.

Each Tool Must Sell Itself

THE WALTON CO.

98 Allyn St., Hartford, Conn.

Onsrud

- ¼ Horse Power
- Weight 1 lb. 15 oz.
- Automatic Lubrication
- Vibrationless
- Balanced
- Trouble-Free

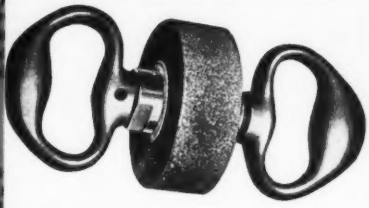
50,000 R. P. M. Turbine Grinder

Experienced die makers will tell you why they like the Onsrud MD-1 Grinder. Here is a 50,000 R.P.M. unit with ¼ H.P. that actually makes the work fly. Handles with superb ease. Won't heat up by overloading. Can also be mounted and used as a stationary grinder.

Write for Bulletin

Onsrud Machine Works, Inc. 3916 Palmer St., Chicago, Ill.

The Desmond
CRACKERJACK
Grinding Wheel Dresser



The 4" dia. wheel is mounted on dust protected ball bearings with safety type handles.

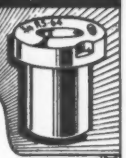
It will quickly dress a square edge or bevel on your grinding wheel.

The Desmond-Stephan Mfg. Co.
URBANA, OHIO

Canadian D.-S. Co., Hamilton, Ontario

ACME
Standardized
JIG BUSHINGS

Acme Standard over 6700 Items
A.S.A. Standard over 4200 Items



Acme Drill Jig Bushings are made by the most exacting, scientific methods — insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

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Individual STACKBINS keep parts within easy reach — cut waste hand motions — speed up any parts handling job. Full width hopper fronts and perfectly smooth interiors make removal of parts swift and simple. Patented construction lets STACKBINS take roughest handling without damage.

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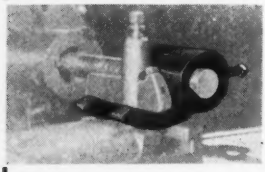
STACKBINS save time—space—labor. They're durable and inexpensive. Write to Stackbin Corp., 53 Troy St., Providence, R. I.

BORING BAR HOLDER



HOLDS ANY SIZE BAR FROM ¾" TO 2" DIAMETER. Can be used on 16" to 30" lathes. Rocker legs elevate bar to center line of lathe.

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Accuracy—Prompt Service

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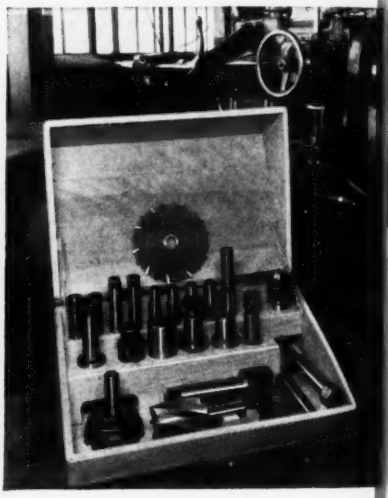
stallation requirements, the block can be mounted in any position by turning the ball on its horizontal axis to a position that will allow the oil cup to be mounted upright. A precision machined cast iron ball increases oil capacity.

The entire assembly, consisting of only three parts, is attractively cadmium plated to resist corrosion. The block is available in shaft sizes from ½ to 1 inch.

"Modern" Quick-Change Boring Mill Set

The Modern Collet and Machine Company, 401 Salliotte St., Ecorse, Mich., has added a complete set of boring mill bars and adaptors to its line. The set,



"Modern" Quick-Change Boring Mill Set

to be known as the "Modern" Quick-Change Boring Mill Set, is assembled in a sturdy box of a convenient size for use on a work bench next to the machine.

The Modern Quick-Change Boring Mill Set has been designed to improve boring mill operation in many ways. Once a boring bar has been set to bore a hole, it may be removed from the holder and replaced in exactly the same position, thereby assuring accurate diameters and depth of holes without exhaustive checking. It is claimed that end cutting, side cutting, or shear cutting tools cannot work out, pull out, or in

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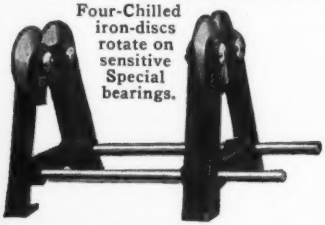
Balancing Ways
No Leveling Required
A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



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Bulletin 25 describes COMTORPLUG

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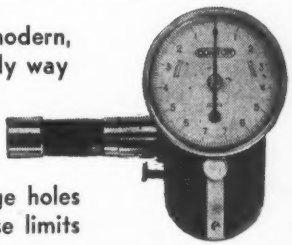

to gage holes to close limits

Use this unique expanding plug gage to obtain POSITIVE accuracy to fractional ten-thousandths. Automatic features eliminate human variations of feel. Shows actual size, detects out-of-round, front or back taper, barrel shape, etc.

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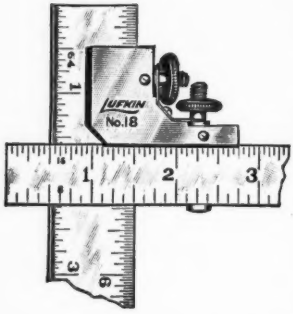
any way change position during cutting operations, making possible accurate milling and facing and avoidance of spoilage. Tool bit holes are at right angles to the bars so that spotfaced bosses are secured with a straight tool without any concave or convex variations. The set is said to efficiently operate up to an 8-in. face mill and still retain all the quick-change features.

All boring bars or adaptors in the set can be interchanged in the chuck in approximately five seconds. All of the tools offer a rigidity necessary for fine work. The main holder and all parts subject to axial and/or radial strains are made of high grade alloy steels and tempered to withstand severe shock loads. The equipment is readily adaptable to either boring or milling machines.

Lufkin No. 18-A Right Angle Rule Clamp

A right angle rule clamp which will hold firmly at right angles a combination square blade of 12, 18 or 24-in.



Lufkin No. 18-A Right Angle Rule Clamp

length and any regular steel rule not over 1 in. wide is now being marketed by The Lufkin Rule Co., Saginaw, Mich. The clamp can also be applied to thin steel squares.

The clip with prongs at each end is a feature of the Lufkin Rule Clamp. These prongs at all times hold both clamp nuts in place, thus eliminating interference of the two bolts and nuts. Thumb nuts of the No. 18-A Right Angle Rule Clamp are knurled for good grip and are of a size most convenient to operate.

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Standard or Special Drills
CIRCLE "R" combination center drills are cost-cutting production tools. Special alloy and high speed steel. Write for catalog.
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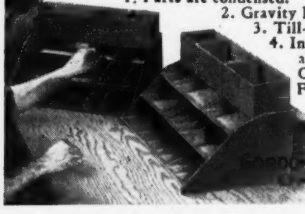
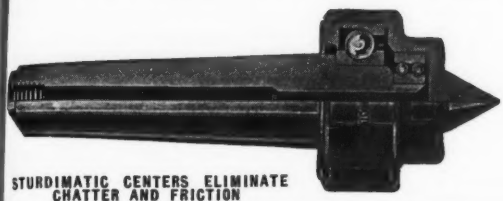

GORDON L. HALL CO.
CONN.

IT TURNS WITH THE WORK . . . .



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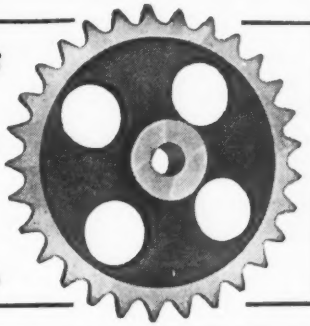

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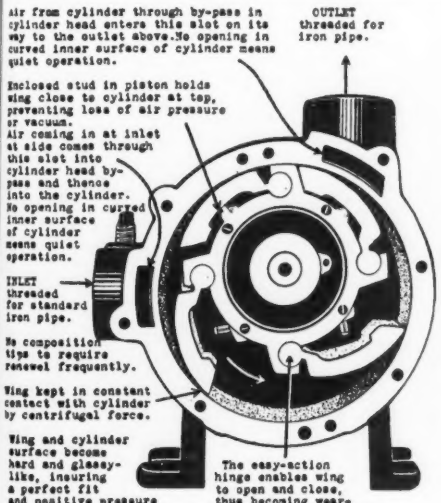
Air from cylinder through by-pass in cylinder head enters this slot on its way to the outlet above. No opening in curved inner surface of cylinder means quiet operation.
OUTLET threaded for iron pipe.
Enclosed stud in piston holds wing close to cylinder at top, preventing loss of air pressure or vacuum.
Air coming in at inlet at side comes through this slot into cylinder head by-pass and thence into the cylinder. No opening in curved inner surface of cylinder means quiet operation.
INLET threaded for standard iron pipe.
No composition tips to require renewal frequently.
Wing kept in constant contact with cylinder by centrifugal force.
Wing and cylinder surface become hard and glassy-like, insuring a perfect fit and positive pressure or vacuum.
Big air space resulting from small piston and curved wings.
The easy-action hinge enables wing to open and close, thus becoming wear-compensating by the action of centrifugal force.

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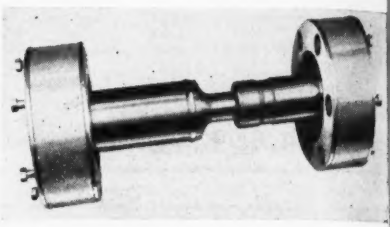
Makers of Good Machinery For Fifty Years

Morflex Radial Coupling Drive Shaft

The illustration shows the Morflex Radial Coupling Drive Shaft, product of Morse Chain Company, Ithaca, N. Y., which combines the features of the standard Morflex Radial Coupling in a high grade slip joint drive shaft for use as a remote drive, or where added flexibility may be necessary. The slip joint is full spline construction, grease tight, and slides freely under load. Shaft members are accurately machined from high grade steel forgings, piloted into coupling hub members and firmly welded. The entire shaft assembly is carefully balanced for smooth operation. The unit is specially adapted for use on Dynamometer drives and other installations in which endwise shaft float may be encountered.



Morflex Radial Coupling Drive Shaft

The Morflex Radial Coupling Drive Shaft is made in two types; the Long Coupled, where tubing is added to suit customers' requirements, and the Short Coupled, which is made up in one standard length. Both types are made in various sizes with capacity ratings of from 2 to 27 h.p. per 100 r.p.m.

Hannifin Sensitive Pressure Control

Hannifin Manufacturing Company, 621 S. Kolmar Ave., Chicago, Ill., has developed a new type of sensitive pressure control for use on Hannifin Hydraulic Presses for straightening, forcing, press assembly, and similar work. The press illustrated is a 20-ton high speed straightening press equipped with both hand and foot lever control.

The operation of the pressure control allows an unusually rapid operating

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AND TROUBLE . . . BY SPECIFYING NATIONAL TWIST DRILLS, HOBS, REAMERS . . . MILLING CUTTERS, *Special* TOOLS

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Good Gears Only
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Any Quantity
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THE CINCINNATI GEAR CO.
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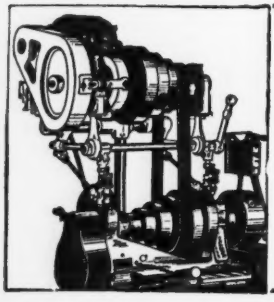

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In a recent installation, the customer specified the use of idle motors he had around his plant. Upon investigation, he found that only Remco Motor Drives rigid enough to support these motors in operation. The motors ranged from 500 to 600 lbs. Get details—write! Remco Products Corp., State and Hay Sts., York, Pa.

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16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

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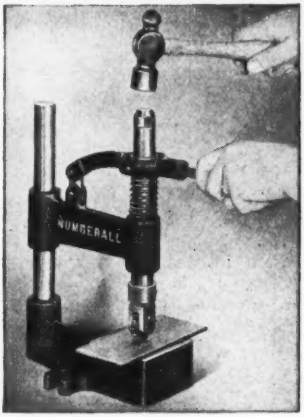

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COMPLETE
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Wet Grinding
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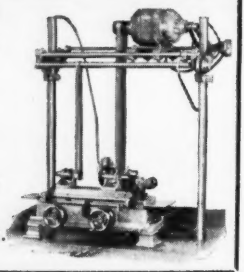

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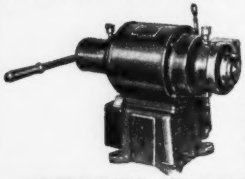

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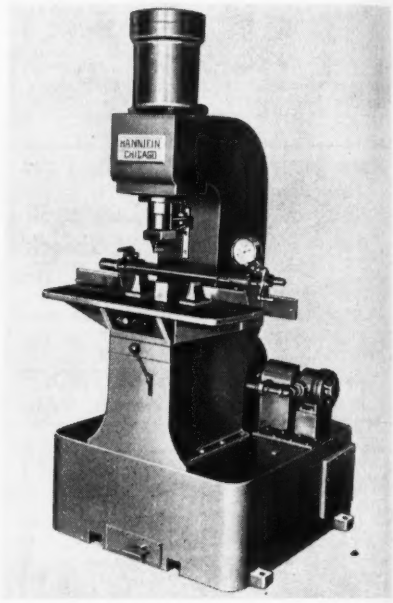
cycle, with finger-tip or light foot control of the ram movement on the advance stroke and of ram pressure during the working stroke. Ram movement and pressure control is accomplished by means of a single hand lever or foot pedal.

The operation of the control is as follows: Initial movement of the con-

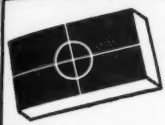


Hannifin Sensitive Pressure Control

trol lever (within the first inch of lever travel) moves the ram down rapidly, at nominal pressure. The ram will move down until it touches the work, and then stop. Movement of the control lever beyond the approach position causes pressure to be exerted by the ram, the working pressure being proportional to the distance the control lever is moved. Thus any required working pressure at the ram, up to the capacity of the press, can be obtained merely by moving the control lever down. Releasing the control lever at any point automatically returns the ram to top position with a high speed return stroke.

With the gage indicating pressure exerted at the ram, an automatic inspection of sufficiently tight fit of parts

BEX LAYOUT STAIN



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5 oz. Can (Brush in lid)..... .50
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BEX LAYOUT STAIN REMOVER

Instantly cleans off BEX Stain.
4 oz. Can..... .25
F. O. B. PITTSBURGH, PA.

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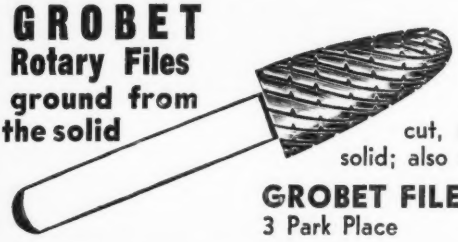

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with "HALLOWELL" STEEL BENCH-DRAWERS

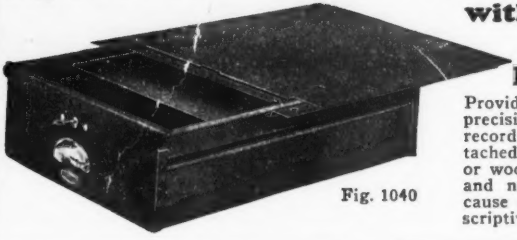

Fig. 1040

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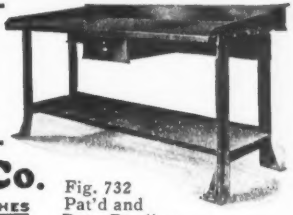

Fig. 732
Pat'd and Pats. Pending.
Drawer is extra.

STANDARD PRESSED STEEL CO.

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JENKINTOWN, PENNA.
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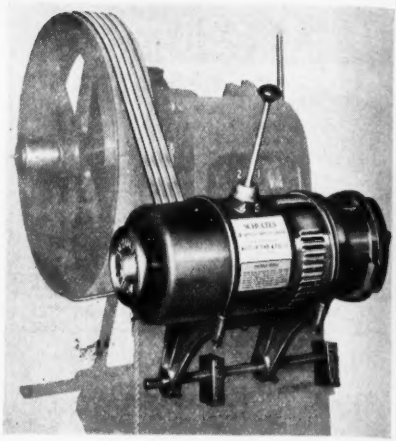
being pressed into place is obtained. Limits of pressure required for any individual operation are easily determined, and the operator then merely observes the gage to make certain that the fit is sufficiently tight. Two adjustable hands on the gage can be set to indicate maximum and minimum pressure limits.

Schultes Motor Drive

A small but powerful motor drive unit for application to machine tools has been developed by Westlof Tool & Die Company, 430 Bellevue Ave., Detroit, Mich. The unit may be adapted to any machine requiring changes of speed, the Schultes single shift lever assuring positive and instant selection of speeds with ease and safety.

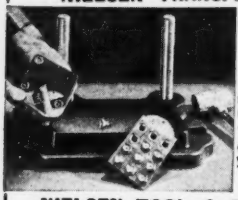
The entire motor unit can be revolved in its cradle to locate the gear shift lever in any desired position. A handwheel at the end of the unit enables the operator to revolve the spindle of the machine by hand when using an indicator in setting up a job. Belt tension is easily adjusted by means of a hand screw. A rigid mounting arm or bracket is supplied with each unit.



Schultes Motor Drive

The unit is powered by a small flange-type motor with standard NEMA frame fitted to the housing. Four speeds are available; if eight speeds are desired, a two-speed motor may be used. Ball and roller bearings are used throughout.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods.

7 Sizes U. S. S.—Inexpensive — Last for years.

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SHOULDER—PROFILE
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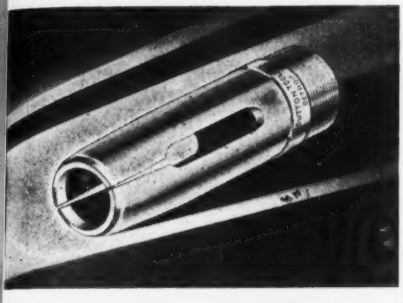
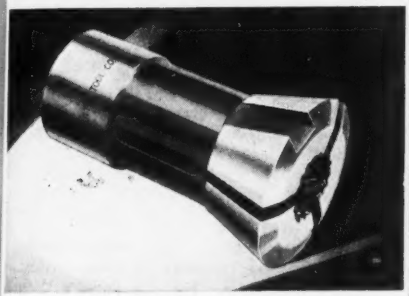


Sutton Feed Fingers



Sutton DIAMOND-GRIP Collets

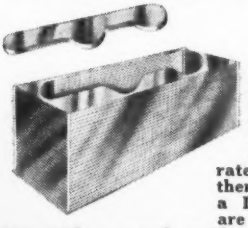
These two Sutton products will work together to improve your screw machine production. The finger is given a special spring-temper treatment that produces long-lasting resiliency. The deep and clean-cut diamond serrations in the collet grip tighter under less tension ♦ ♦ Put this team to work and watch the percentage of spoilage drop sharply. All styles of Fingers and of DIAMOND-GRIP Collets listed for all screw machines in Sutton Catalog 12. Send for a copy.

SUTTON TOOL COMPANY
2842 W. GRAND BLVD. DETROIT, MICH.

Represented in Canada by

HI-SPEED TOOLS, Ltd. Galt, Ont.

51 PARTS AT ONE TIME *on the* Do-All



Bethlehem Shipbuilding Corp., Quincy, Mass., arc welds corners of 51 separate plates to hold them firm. Then, on a Do-All, 51 parts are cut out at one time with no rough or "burned" edges.

Meet Today's Challenge for Greater Speed

Contour Sawing is the new Do-All process of machining. Recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.

Does work of 3 machines. Do-All is a moderately priced, rugged, precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 23 countries by such firms as Ford, Fisher Body, Cadillac, Baldwin Locomotive, Douglas Aircraft, U. S. Navy, International Harvester, General Electric, Westinghouse, Ace Tool & Die, Glenn L. Martin, etc.

Let a factory trained man bring a Do-All to your plant and show you what it does, what it saves on your own work.

FREE New Handbook on Contour Machining; 100 pages of valuable metal working helps.

CONTINENTAL MACHINES, INC.
1306 S. Washington Ave., Minneapolis, Minn.

☐ Send data on the Do-All MM-6
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Name.....

Address.....

Hardened and ground spline shafts and gears operate in an oil bath encased in a dust-proof and leak-proof housing. Instant reversibility is possible with all four speeds.

Dayton Rogers Model "C" Pneumatic Die Cushion

The Dayton Rogers Mfg. Co., 2830 S. 13th Ave., Minneapolis, Minn., has added to its line a single unit, Model "C" Pneumatic Die Cushion. These general utility cushions are made in six sizes, having piston diameters from 6 to 16 in. progressing by 2 in., and drawing capacities from 3 to 7 in. No surge tanks are necessary in the drawing of shells up to a depth of 1½ in. The cushion is so designed that it may be directly attached to the bottom side of the bolster plate of the average inclinable or straight side punch press.

Dayton Rogers Model "C" Pneumatic Die Cushion

When the die cushion is not needed, such as in blanking and piercing work, and when the cushion is not under air pressure, the air in the cylinder may be "bled," allowing the pin plate to drop down or retreat to the bottom of its maximum drawing capacity, thus allowing the blanks and pierced slugs to drop through the free opening in the bolster plate. If the press is inclined,

STEEL STAMPS AND STEEL DIES

For Hand and Press Stamping

More than 45 years experience producing dies for stamping on Steel, Brass, Celluloid and other materials. *Prompt Service, Fair Prices.* Established 1892.

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Special Blades for shearing stainless steel.

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Universal Die Cushions for deep drawing, forming die, pressure pad control, and blanking die stripper actions.

Write for engineering power press die booklet.

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The **DRIP-DROP** is a thermal oiler dropping oil on the bearing from the top exactly as needed.

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MILWAUKEE, WIS., U. S. A.

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"SELECT-O-SPEED"
TRANSMISSION DIVISION

A LOW COST Variable Speed Transmission is now available for the first time for small machine installations! **Ideal "Select-O-Speed"** offers the solution to your variable speed transmission problems. Easily adaptable to machine tools, conveyors, winders, pumps, stirrers, mixers, etc.—wherever variable speed is desirable.

Lengthens Life of both new and old machines.

Cuts Costs by furnishing the exact speed needed for every job, or for different parts of the same job.

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Uses Standard V-Belts—easy to install.

Furnished as a packaged unit ready to install on your machine—sets up in line of present drive. Sizes up to 7½ H.P. Let our experienced Transmission Engineers help you solve your transmission problems.

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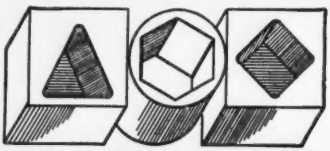
IDEAL COMMUTATOR DRESSER COMPANY
1031 Park Avenue — Sycamore, Illinois



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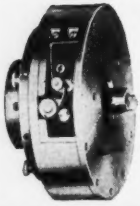


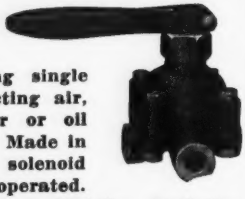
M-D Facing Heads
With Automatic Feed

Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically and covers faces 6" to 30".

Write for circular.

MUMMERT-DIXON CO.
120 PHILADELPHIA ST., HANOVER, PA.

3 and 4-Way Control Valves



For operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressure up to 3000 lbs. Bulletins on request.

Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam Traps and Separators, Air Separators, Traps and Vents, Etc.

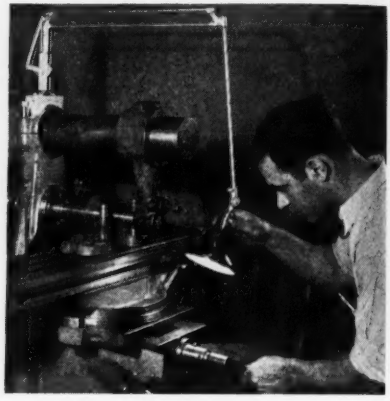
W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Penna.

they will automatically drop off the pin plate to receivers below the press.

The Model "C" Cushion is furnished with a pneumatic regulator and gage which automatically determines the air pressure used in all cases and maintains a predetermined, constant pressure on the cushion cylinder at all times.

Dazor Floating Lamp

A lamp designed for use where a "spot" of light is needed at short range and which can instantly be adjusted to any desired position has been brought



Dazor Floating Lamp

out by Dazor Manufacturing Corp., 4485 Duncan Ave., St. Louis, Mo. The lamp, known as the Dazor Floating Lamp, is suspended by two arms which are scientifically balanced in all positions. This double lamp arm permits any horizontal or vertical adjustment, a double swivel at the lamp socket permitting any angular adjustment of the light. The lamp can be rotated horizontally in a complete circle.

The arm has a horizontal extension of 34 in., vertical extension of 34 in. above and 26 in. below the base. Bases of various types can be supplied; a malleable iron screw clamp base for clamping to any thickness up to 2 in., a cast iron bracket base for attachment to the underside of a drawing table, a cast iron bracket base for attachment to vertical surfaces only, a heavy 10-in. cast iron base by which the lamp is suspended for floor use, a low flat cast

Standard Grinders

¼ H. P. 6" wheels to 15 H. P. 30" wheels.
DISC GRINDERS, 1 H. P. to 7½ H. P.
Buffing and Polishing Lathes, ½ H. P. to 20 H. P.
VERTICAL ANGLE PLATE GRINDERS
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Tool Post and Angle Plate Grinders for Lathe, Shaper, etc. ¼ H. P. to 10 H. P.

The Standard Electrical Tool Co.
8th and Evans Sts. Cincinnati, Ohio

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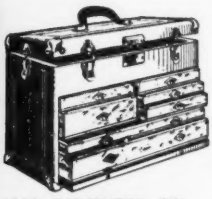

have proved their quality in 33 years of leadership. Be sure your chest is a genuine Gerstner.

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MODERNIZE—Install Oliver Tool Grinding Equipment and Grind your Drills, Cutters, Taps and other cutting tools efficiently.

You can—Increase Production.
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Obtain Savings that will soon pay the cost of the equipment.

Don't delay—write for Details TODAY.

Let us grind a few Drills for test—No obligation.

Model 510 Drill Grinder for ¼ to 3" drills. Automatic operation —Variable clearances — Variable point angles.

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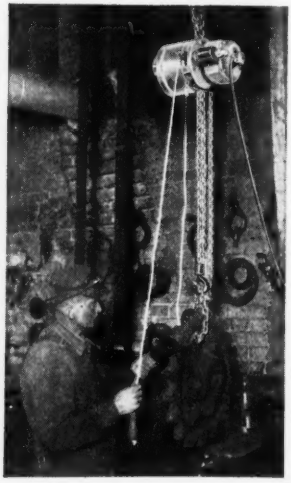
1430 E. Maumee Street Adrian, Michigan

iron base for clamping to desks or tables, and a low stamped steel base for attachment to horizontal surfaces only. Reflectors are available in 5½, 6½, and 9-in. diameters. The lamp is available in a wide variety of finishes.

Coffing "Quik-Lift" Electric Hoist

As the result of several years of intensive research and development work, the Coffing Hoist Co., Danville, Ill., has placed on the market an electric hoist to be known as the "Quik-Lift." It is stated that for dependable and economical service the Quik-Lift incorporates a maximum amount of efficiency with speed, power, and durability.

The Coffing hoist is equipped with a heavy-duty ball bearing motor, fully enclosed, high starting torque, single and three phase, and is constructed with lubri-seal ball bearings, together with gears and pinions of special heat-treated alloy steel, sealed and running in oil. The hooks are drop forged and are of heat-treated alloy steel, and are said to withstand 200 per cent overload. Other features include an extra-heavy load chain which is said not to kink or bend and to have actual strength



Coffing "Quik-Lift" Electric Hoist

GEARS Spur, Worm, Bevel, Helical or Special

WE DO Surface Grinding, Internal and External Grinding, Lapping, Splining and Broaching.
We specialize in grinding hardened steel bushings, cam rollers, etc.
25 years spent in serving the machine trade guarantees quality work and prompt service.

THE TAYLOR MACHINE COMPANY
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GRAY TURRET HEAD METAL CUTTER OR NIBBLER

Cuts all metals any shape—30 gauge up to 1".

GRAY. Originator of First Practical Metal Cutter or Nibbler.
GRAY Cutters Still Lead.

GRAY MACHINE CO.
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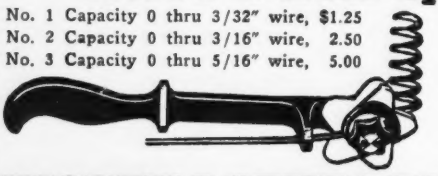
Here's a Real Spring Winder!

No. 1 Capacity 0 thru 3/32" wire, $1.25
No. 2 Capacity 0 thru 3/16" wire, 2.50
No. 3 Capacity 0 thru 5/16" wire, 5.00



Will Earn Its Cost In one Day

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

HJORTH LATHE & TOOL CO. 12 BEACON STREET WOBURN • MASS.

several times over rated capacity, foolproof limit switches, shoe type brake with large braking surface to assure smooth and positive operation, and sensitive controller with heavy-duty contact points. The hoist can be plugged into any circuit or current connection, either A.C. or D.C., and is said to use only a few cents worth of current per day.

The Quik-Lift is available with either load hook or trolley suspension in capacities from 250 to 4,000 lbs., and weighs from 89 to 195 pounds.

Lyon Truck With Hydraulic Elevating Table

Illustrated herewith is the Lyon truck with hydraulic elevating table which has been designed specifically by Lyon

Lyon Truck With Hydraulic Elevating Table

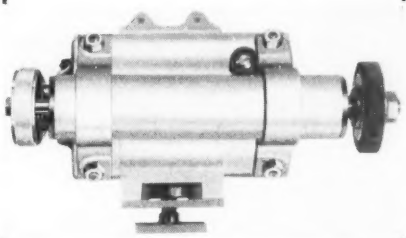
Iron Works, Greene, N. Y., for handling dies and heavy rolls in and out of presses and rolling machines respectively and, in addition, for use in handling sheet metal in feeding various types of machines, such as shears, presses, and punches.

A winch is mounted on the front end of the elevating table for use in pulling on the rolls and dies and elevates with the table as the latter is raised. The table is 24 in. wide x 48 in. long, has a lowered height of 20 in., and can be elevated hydraulically to height of 43 in. Elevation of the table is obtained by means of lever arrangement

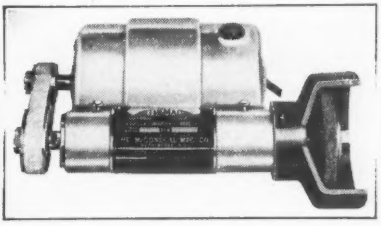
7,500 to 30,000 R.P.M.

with THEMAC

PRECISION GRINDERS



1/5 H.P. 10,000 & 30,000 R.P.M.
Special Type J Grinder—$39.50



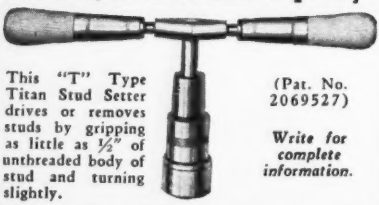
1/3 H.P. 7,500 to 29,000 R.P.M.
Special Type J-1 Grinder—
$49.50.

Other models from
1/8 to 1/2 H.P.

Write for details.

The McGONEGAL MFG. CO.
Jones Bldg. East Rutherford, N. J.

SET STUDS "The Roll Grip Way"

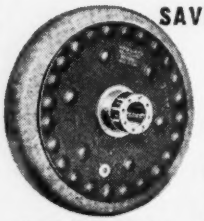


This "T" Type Titan Stud Setter drives or removes studs by gripping as little as ½" of unthreaded body of stud and turning slightly.

(Pat. No. 2069527)

Write for complete information.

Titan Tool Co., Fairview, Pa.



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Sizes for all trucks.
Casters for all purposes.

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Grand Rapids, Mich.
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Hyatt Roller Bearing Heavy Duty

Clean,
SHARPLY DEFINED
Scribed Lines
SECURED QUICKLY, EASILY AND ECONOMICALLY WITH
Miccro
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LAY-OUT DYE

TRIAL OFFER: A handy five-ounce Combination Brush-In-Can...ideal for shop use and for trial purposes...for only . . . . . **40¢**

MICHIGAN CHROME CO.
6346 E. JEFFERSON AVE., DETROIT, MICH.

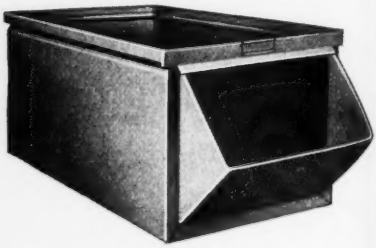
and hydraulic rams. A Lyon two-speed hand-operated hydraulic pump is used for supplying power to the rams. This pump automatically elevates the table when empty at approximately twice the speed as when the table is carrying a load. Various sized table tops, as well as various lowered and elevated heights, can be furnished with the Lyon truck.

Pollard Steel Stacking Boxes

Steel stacking boxes equipped with stacking rims on all four sides are now being manufactured by Pollard Bros.

Pollard Stacking Box

Mfg. Co., 5514 Northwest Highway, Chicago, Ill. The stacking rims are an integral part of the boxes and are made by a series of bends in the steel. Because of the stacking rims on the sides of the boxes, the boxes are said to remain stacked under vibration and will not telescope. All corners of the boxes are reinforced by means of steel bands, therefore permitting delicate parts to be carried without danger of crushing. The boxes can be furnished with rigid or drop handles, and can be made in any size from steel ranging from 16 to 22 ga. Several standard sizes are carried in stock for immediate delivery.



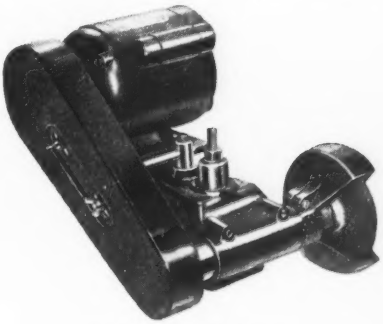
Pollard Open End Stacking Box

Open end stacking boxes for use in stock rooms in place of shelving, for transporting parts to assembly lines, and so on, have also been added to the Pollard line of products. The construction of the open end boxes is the same as that of the stacking boxes previously described with the exception that one end of the open end boxes, as implied, is uncovered in order to make parts readily accessible. A label holder is provided with each box for the convenience of contents identification. The open end boxes can be made in any size from steel ranging from 16 to 22 ga. Several standard sizes are carried in stock for immediate delivery.

Dumore No. 77 Grinder

The Dumore Company, Racine, Wis., has brought out a grinder which is similar in design to the Dumore No. 7, using the same quills and grinder frame, but being equipped with a ½ h.p. capacitor start induction run or constant speed A.C. motor. Of extremely rugged design, the No. 77 is recommended where the majority of the work is external or in the heavy internal class. It is said to be highly efficient for production work.

Power is transmitted from the motor to the wheel by V-belt drive, the belt tension being regulated by sliding the



Dumore No. 77 Grinder

motor base and tightening four cap screws. A complete set of interchangeable sheaves or pulleys allows speeds of from 3,810 to 7,650 r.p.m., which is said to be suitable for wheels of from 3 to 6-in. diameter.

Finish Measuring Microscope

ZEISS

A NEW microscope for measuring finish down to fine grinding. Immediate observation of surface condition under high magnification. Photographic camera for recording. For flat and round objects, threads and gears. Special light stand for use on Machine tools. Catalog FE 182-A176 upon request.

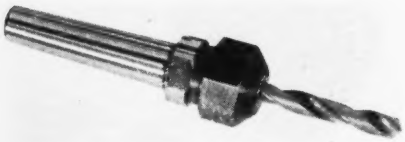
CARL ZEISS, INC.,

485 Fifth Ave., New York — 728 So. Hill St., Los Angeles

Representatives in Principal Cities

Improvements in Universal Collet Chucks

The Universal Engineering Company, Frankenmuth, Mich., has made two additional improvements in its collet chucks. The threads of the chucks are now ground from the solid after hardening, a feature which is said to improve the accuracy of the chuck and also increase its wearing qualities. The other improvement is the handy wrench grip now provided on the shank.



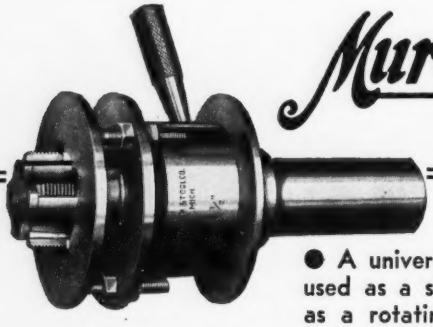
Universal Improved Collet Chuck

In addition to these improvements, Universal has added two new sizes to its line of collet chucks—the Type OW from $\frac{1}{16}$ to $\frac{3}{16}$ in. and Type XZ from $\frac{3}{4}$ to $1\frac{1}{2}$ in. It is now possible to get immediate delivery on Universal Collet Chucks in collet size ranges from $\frac{1}{16}$ to $1\frac{1}{2}$ inches.

Producto All Purpose Heavy Duty Vise

The Producto Machine Co., Bridgeport, Conn., has developed a 6-in. all purpose heavy duty vise designed for use on heavy duty milling machines or boring mills. The vise can also be used with drill attachments which make the vise suitable for adapting it to drilling operations on short run parts, thus eliminating the cost of expensive drill jigs.

The base of the vise is made of semi-steel casting, reinforced on top with hardened and ground wearing and jaw guide plates. To permit extra large opening, the front and rear jaw and nut block are adjustable to any position on the wearing and jaw guide plates. The wearing plates are serrated to receive serrated shoes which are attached to bolts that firmly lock the rear jaw and nut block in any desired position. Due to the fact that the nut block and jaws are adjustable to any posi-



Murchey TYPE "M" (NON-ROTATING) COLLAPSIBLE TAPS

● A universal machine tap that can be used as a stationary tap with handle or as a rotating tap by removing handle. Instant trip at set point.

Chasers are rigidly supported and are hooked into tapered seat of the hardened and ground center pin to insure positive opening and closing.

May we send folder?

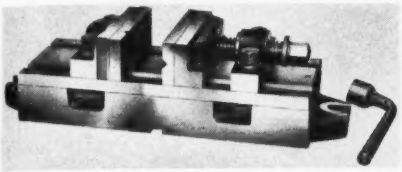
MURCHEY also manufactures:

Self-Opening Die Heads (all styles)
Bolt and Pipe Threading Machines
Pipe Cutting Off Machines
Double End Reaming, Chamfering, Drilling and Threading Machines.

MURCHEY MACHINE & TOOL CO. DETROIT MICHIGAN

tion, only a short turn of the clamping screw is required to clamp work tightly. A separate intermediate jaw can be used to provide for two work-holding positions. To ensure maximum life, all work contacting surfaces of the vise are hardened.

The general specifications for the

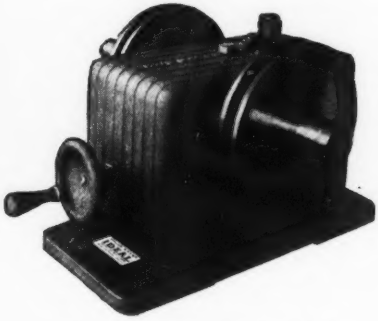


Producto All Purpose Heavy Duty Vise

Producto All Purpose Heavy Duty Vise are as follows: width of jaws, 6 in.; depth of jaws, 2¼ in.; maximum opening of jaws, 8 in.; overall length of vise, 18½ in., and net weight, 75 pounds.

Ideal "Select-O-Speed" Transmission

Hand wheel control is the outstanding feature of a new series of "Select-O-Speed" Transmissions now being produced by the Ideal Commutator Dresser



Ideal "Select-O-Speed" Transmission

Co., 1031 Park Ave., Sycamore, Ill. These new models supplement the standard line of fractional to 7½ h.p. capacity, equipped with lever type control.

Hand wheel control is available on S-O-S Variable Speed Transmissions of sizes from 1½ to 7½ h.p. capacity, and is recommended for use where finer

GIVEN DEPTHS
Diagrams illustrate "Feed-as-you-need" combinations for exacting depth requirements.

The outstanding tool design development of two decades. Use straight shank drills (whole or broken) — Use entire drill or any part of it for given depths — use for single or multiple operations.

Send for detailed information without delay.

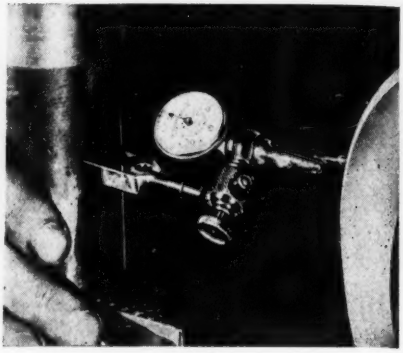
Scully-Jones & Company
STANDARD — SPECIAL PRODUCTION TOOLS
1913 S. ROCKWELL STREET, CHICAGO

speed adjustment and smaller increments of speed are necessary. By merely turning the hand wheel a partial turn, it is easy to change the speed only a few r.p.m. Hand wheel control is especially desirable for installations requiring remote control. By replacing the hand wheel with a set of beveled gears, an extension rod, and a universal joint, the point of control may be taken to a more convenient location.

Starrett "Last Word" Indicator No. 711-F

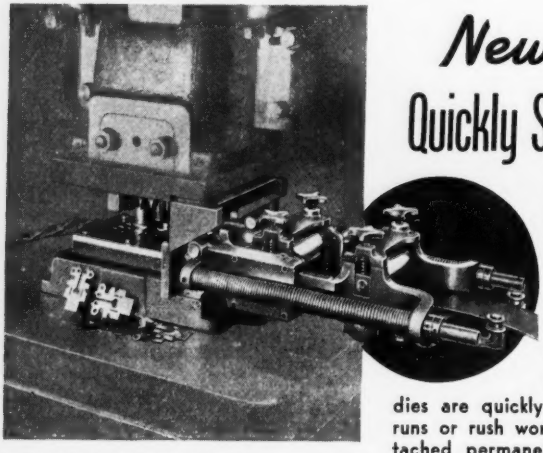
Several new models have been added to the line of test indicators manufactured by The L. S. Starrett Co., Athol, Mass. The complete line now includes gages with ranges of 0.024, 0.025, 0.030, and 0.040 in., calibrated to read in thousandths or ten-thousandths or metric readings; gages with fixed, friction or ratchet joint contact points; with large or small dials; with gooseneck or universal shanks; with fixed or swiveling tubular bodies.

The illustration shows a typical application of the Starrett "Last Word" Indicator No. 711-F which is mounted in the tool post of a lathe by means of a universal shank. This gage has a range of 0.030 in. by thousandths



Starrett "Last Word" Indicator No. 711-F

or it can be furnished in metric, 1-100 mm. Reversible action, ratchet joint contact point, adjustable dial, and swiveling tubular body, are features of the gage.



New DIE FEED
Quickly Set Up on Any Press

Requires no connection to the power shaft of the press.

Handles coiled stock of any practical thickness. Maximum stock width 4". Can be adjusted from 0 to its maximum feed length of 3" in increments of .001".

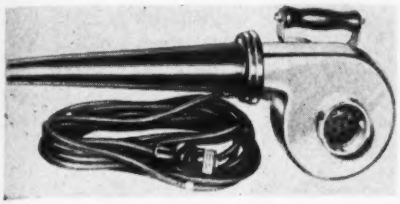
Dickerman Die Feed equipped dies are quickly set up on any press for short runs or rush work. By leaving the Die Feed attached permanently to dies that are used frequently, great savings are made in installation time.

Send for folder No. 82 giving complete story of this new, profit-making device.

H. E. DICKERMAN MFG. CO. 282 WILBRAHAM ROAD SPRINGFIELD, MASS.

Breuer Improved "Tornado" Portable Electric Blower

The Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago, Ill., announces changes in its line of portable



Breuer Improved "Tornado" Portable Electric Blower

electric blowers. Waterlift on the 1 h.p. model has been raised from 46¼ in. to 52 in. with proportionate increases on three smaller models.

The blowers have also been equipped with a new double grease seal ball bearing which requires no oiling. The tools have been redesigned and a double-curved extension handle for floor cleaning has been added to increase cleaning efficiency and speed when used as a suction cleaner.

Ahlberg "Series ED" Pillow Block

A series of inexpensive, light-duty ball bearing pillow blocks has been put into production by the Ahlberg Bearing Company, 3029 W. 47th St., Chicago, Ill., and is now available from stocks of their branches and industrial distributors throughout the country. The units, cataloged as "Series ED," are designed to make anti-friction efficiency practical for many light machine applications where the cost of ball bearings has heretofore been prohibitive, and will make possible the use of substantial, smooth-running, all-metal ball bearing pillow blocks at exceptionally low costs.

The "ED" Pillow Block consists of a specially designed Ahlberg single row bearing in a sturdy and neat die cast housing. The ball bearing is assembled to provide for shaft deflection and misalignment up to 1 deg. Seals are of a floating construction which eliminates friction and increases the life of both the seals and the bearing. The seals

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Because of their super-finished bore, Universal Drill Bushings are exceptionally straight and round. Super-finishing, together with their combined nitrogen and carbon case, provides unusually long wearing qualities. Their black rust-proof dome adds to the appearance of your tools.

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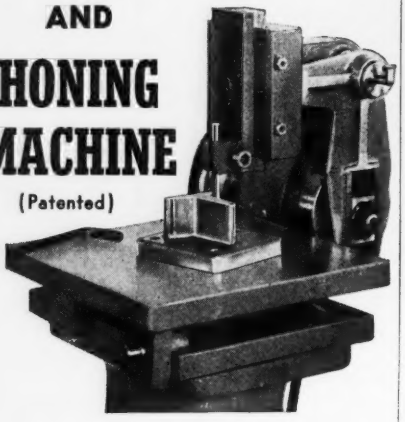

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Machine finish your punches. Eliminate the slow, tedious hand method.

Guaranteed to cut your cost. Price and description on request.

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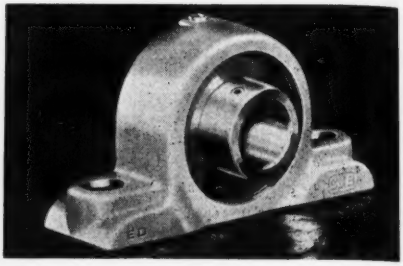
MACHINE COMPANY, Inc.
MUSKEGON • MICHIGAN

are made of Neoprene, a long-wearing synthetic rubber which is not affected by oil or grease. Standard shaft sizes are ½, ⅝, ¾, 1⅛, 1, 1⅛, and 1⅜ inches.

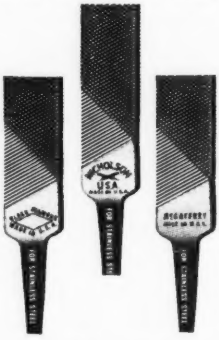


Ahlberg "Series ED" Pillow Block

The units are specially adapted to domestic air-conditioning equipment, fans, packaging and labeling machines, models, laboratory equipment, displays, and so on.

Stainless Steel File

A file with teeth that have extra resistance to the abrasive effect of such tough, dense metals as stainless and



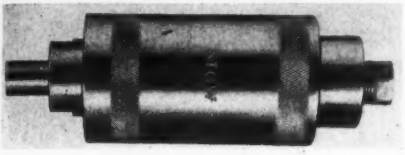
Stainless Steel Files

other alloy steels has been announced by Nicholson File Company, Providence, R. I. It is made in Nicholson, Black Diamond, and McCaffrey brands. Properly used with a light pressure and a slow, steady stroke, the Stainless Steel File removes the metal rapidly and leaves a good finish. It is said to outwear general purpose files on alloy steels.

To identify the new product, each file is stamped on its tang with the words, "For Stainless Steel." Nicholson, Black Diamond, and McCaffrey Stainless Steel Files are available in the same shapes and sizes as Nicholson general purpose files, and are sold at regular list prices.

Stow Reciprocating Handpiece

A reciprocating handpiece for use on flexible shafting power drives for die makers and metal pattern shops has



Stow Reciprocating Handpiece

been introduced by Stow Manufacturing Company, Binghamton, N. Y. The handpiece converts the rotary motion of the flexible shaft into a reciprocating action of 1-in. stroke. Files and saw blades with ¼-in. shank can be inserted in the handpiece.

The handpiece is designed for use at speeds not to exceed 1,000 r.p.m. It is interchangeable in the same size range with other flexible shaft attachments.

Ingersoll Shear Clear Face Mill

A face milling cutter designed especially to meet the problem of chip clearance has been brought out by The Ingersoll Milling Machine Company, Rockford, Ill. The feature of the tool consists in that the cutting edges have been set at such angles that the chips move outwardly, away from the surface cut, and not inwardly. This design precludes the packing of chips in the face of the cutter, and eliminates scoring of the finished surface by chips being dragged by the teeth.

To attain this objective, the cutting blades are set at a negative rake and steep positive shear angles. The corner of the cutting angle is further broadly chamfered to direct the chips outward. The combination of angles and chamfer can be varied to suit the work. The use of the chamfer precludes possibility

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Their sensitiveness, accuracy, rigidity and trouble-free service mean satisfaction and decreased tapping cost to you.

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Ingersoll Shear Clear Face Mill

of the cutters being used in sharp corners. The Ingersoll Shear Clear Face Mill is available with inserted blade cutters of high speed steel, J-Metal and cemented carbides.

Socket Screw Drafting Room Chart

A circular chart 10½ in. in diameter, designed so that the user can instantly ascertain all of the various diameters, lengths, head sizes, socket aperture sizes, and threads per inch for any size of socket set screw, socket head cap screw, or socket head stripper bolt is now being distributed by Parker-Kalon Corporation, 200 Varick St., New York, N. Y. The chart is intended for use in drafting rooms, or by buyers or plant executives, and condenses in form suitable for ready reference a large amount of data essential to users of socket screws.

One of these charts will be sent free

Socket Screw Drafting Room Chart

to any engineer, draftsman, or production executive.

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Abrasive Cut-off Machine

Uses Abrasive Wheels or Saws, and instantly swivels and cuts any angle from 45° left to 45° right, doing clean, instantaneous work on metal bars, shapes or tubes.

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News Pictorial Service

A free plant bulletin board, 3 ft. 9 in. x 3 ft. 8 in. in size, is being offered

News Pictorial Service Bulletin Board

to manufacturing plants in connection with the News Pictorial Service offered by Illustrated Current News, 81 Willow

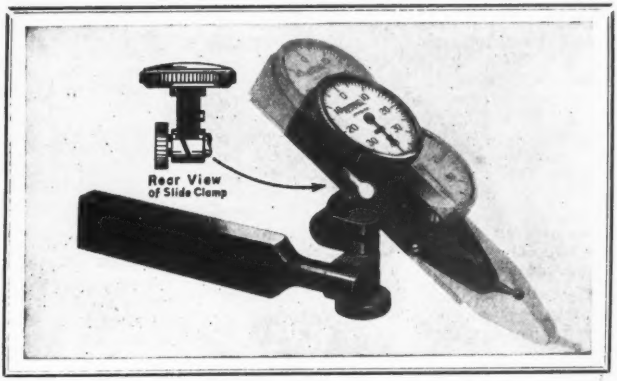
St., New Haven, Conn. The News Pictorial Service consists of bulletins and illustrations based on subjects of interest to employees in general. One-fourth of the bulletin board provides a black board upon which timely bulletins can be written in chalk.

"Modernize With Gisholt" is the title of a 12-page booklet describing Gisholt 1L, 2L, and 3L high production turret lathes. The booklet is profusely illustrated throughout and contains a list of specifications together with tables and illustrations of standard tool sets for each type of Gisholt turret lathe. Copy of this booklet will be sent free by writing to the Gisholt Machine Co., Madison, Wisconsin.

U. S. Electrical Tools Catalog No. 54. The United States Electrical Tool Co., Cincinnati, Ohio, has prepared for distribution of the 1939 edition of its condensed catalog covering the complete line of U. S. electrical, portable, bench and floor tools. The catalog is only 3½ in. wide x 6¼ in. long so that it can be carried in the vest pocket for quick reference. The cover is attractively printed in red and black on a deep blue background. Included in the catalog are illustrations of the various U. S. products, as well as construction details and prices. Copy free.

Detroit Washer Dies. A four-page folder containing specification tables on combination dies, gang washer dies, and round dies for use in making washers of any material is now being issued by the Detroit Stamping Co., 3445 W. Fort St., Detroit, Mich.

Landis Heat Treated Die Heads. The Landis Machine Co., Waynesboro, Pa., is now issuing a 16-page bulletin illustrating and describing its Lanco, Landmatic, and Landex heat treated die heads for bolt threading machines, turret lathes, and automatic screw machines respectively. Various attachments for each type of die head are also illustrated and described. Several pages are devoted to tables of specifications and diagrams of clearances for the Lanco, Landmatic, and Landex die heads. Copy of Bulletin F-90 free upon request to any mechanical executive who writes to the above company.



The Handiest Dial Indicator In The Shop

You can use it anywhere in any position—on the bench, on a lathe, or any other machine for that matter. The dovetail slide makes it easy to set in place and the clamp is universal. The contact point is sensitive to either up or down motion. Model No. 1 graduated .001"—Model No. 2 graduated .0001". Also metric graduations.

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"Unsung Heroes of Industry." A humorously written booklet entitled "Unsung Heroes of Industry," in which Koebel diamond wheel dressers are illustrated and described, is now being issued by the Koebel Diamond Tool Co., 1200 Oakman Blvd., Detroit, Mich. Among the various types of tools included in the booklet are the Koebel Multi-Point, Multi-Edge, and Multi-Set Diamond Dressers. Copy free upon request.

Lyon Tool Storage Equipment. A catalog completely illustrating and describing the construction and use of Steel Tool Storage Equipment has been published by Lyon Metal Products, Incorporated, 1303 River St., Aurora, Ill. It pictures a wide variety of storage equipment and describes the use of each for different types and classes of small tools. Included also are methods of bar storage, shop equipment, enclosure panels, and tool and die storage. This improved and modernized tool storage equipment assists in protecting valuable tools, provides visible, accessible storage, and saves labor and floor space.

Copy free to any mechanical executive upon request.

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Saves Air - Low Maintenance
Positive Air Control with Ease
Air-O-chek
MADE OF BAR BRASS and STAINLESS STEEL
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Only Air-O-Chek Valves have the enclosed actuating lever connected to valve by ball and socket joint.
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"The Rivitor in the Aircraft Industry." The Tomkins-Johnson Co., 620 N. Mechanic St., Jackson, Mich., is now issuing Bulletin No. R-14 discussing the application of the Tomkins-Johnson Rivitor to the aircraft industry. Standard Rivitors that have been tooled for handling aircraft sections are illustrated and described in the bulletin, copy of which will be sent free upon request.

Themac High Speed Grinders. This 16-page booklet illustrates and describes 10 different types of Themac high speed portable electric precision grinders manufactured by The McGonegal Mfg. Co., Jones Bldg., East Rutherford, N. J. Equipment included with each type of grinder together with specifications are given in the booklet, copy of which will be sent free upon request.

New Departure Bearing Service Manual. The use of New Departure bearings in automobiles and trucks is the subject of a 32-page service manual published by The New Departure Mfg. Co., Bristol, Conn. Individual applications of New Departure bearings to fans, water pumps, generators, clutches, transmissions, front and rear wheels, differentials, and rear axle pinions are illustrated and described. Bearing removal, cleaning, installation, and lubrication are also discussed. Copy free.

Apex Catalog No. 11. A 12-page combination catalog, manual, and price list on Apex-Phillips screwdrivers and bits for electric, air, and spiral drivers is now being distributed by The Apex Machine & Tool Co., Dayton, Ohio. The manual is designed to supply tool supervisors, production engineers, master mechanics, and purchasing agents with detailed information regarding drivers for Phillips recessed head screws and slotted head screws. Included are two tables for determining the correct size of Phillips wood, machine, and sheet metal screws and stove bolts, and of flat, oval, binding, and round head slotted screws. Power bits for 32 makes and styles of power and hand drivers as well as those designed for specific purposes are illustrated.

Catalog No. 11 is bound with an attractive, durable cover to withstand excessive handling and will be sent to the executives mentioned above free upon request.

Ry Alloy Steel. This steel was especially developed to meet the demand for an oil hardening steel which, when heat treated, would develop high hardness and deep penetration, and have minimum distortion and freedom from cracking. A bulletin giving full particulars regarding Ry Alloy Steel is available free upon request to Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago, Illinois.

P&H Industrial Cranes. The Harnischfeger Corporation, manufacturers of P&H cranes with capacities from 3 to 300 tons, announces the completion of Bulletin C-6, "Industrial Cranes," which covers completely the design and application of the line of P&H Industrial Cranes for general usage in industries the world over. Starting with an illustrated review of crane history, the book contains complete, concise and detailed information which leaves nothing to the imagination in regard to the structural and mechanical details of P&H cranes. It describes the standard type "H" crane, standard open and enclosed cabs, standard alloys, load blocks, limited headroom cranes and trolleys, and so on. Clearance dimensions, hoist trolley and bridge traverse speeds are included to supply all the facts about each unit.

The book contains many interesting action photos, showing the use of industrial cranes in all types of plants from railroad maintenance yards to steel fabricating plants, machine tool shops and chemical production centers, and should be of real value and interest to all plant executives in plants where materials are lifted, lowered and moved in the process of manufacture. Copies of the book may be obtained by writing the Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wis.

Chicago Multiple Rivet Setters are presented in an attractive broadside now being issued by Chicago Rivet & Machine Co., 1830 S. 54th St., Chicago, Ill. Copy free upon request.

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To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. **Surface Grinding Machine**
Circular D-B-2 illustrates and describes the Walker Single Stroke Surface Grinding Machine, Model D-B. O. S. Walker Co., Inc., Worcester, Massachusetts.

2. **Vertical Hydro-Broach Machines**
Cincinnati Single Ram Vertical Hydro-Broach Machines, built by The Cincinnati Milling Machine Co., Cincinnati, Ohio, are detailed and illustrated in bulletin M-834.

3. **Visible Automatic Lubrication**
Bulletin 270-C on TRICO Automatic Oilers contains helpful hints for avoiding bearing failures, and motor burnouts, increasing machining efficiency, lowering power costs, saving lubricants, etc. Trico Fuse Mfg. Co., Milwaukee, Wisconsin.

4. **Ball Bearing Ideas**
Ball Bearing Ideas by New Departure Engineers is the title of a helpful 20-page booklet just released by New Departure, Division General Motors Corp., Bristol, Connecticut.

5. **Woodruff Type Keys and Cutters**
Catalog V-111, issued by The Whitney Chain and Mfg. Co., Hartford, Conn., completely details Whitney Woodruff Type Keys and Cutters.

6. **High Speed Grinders**
Themac High Speed Portable Electric Precision Grinders are illustrated and described in a new circular released by The McGonegal Mfg. Co., East Rutherford, New Jersey.

7. **Diamond Wheels**
"Two Diamond Wheels for Grinding the Cemented Carbides" is the title of a new circular published by Norton Company, Worcester, Massachusetts.

8. **Heat Treated Die Heads**
Bulletin F-90 has just been released by Landis Machine Co., Inc., Waynesboro, Pa. It contains considerable information on Landis Heat Treated Die Heads.

9. **Diamond Tools**
An informative folder on diamond tools with recommendations for diamond weights and wheel sizes. Standard Diamond Tool Corp., 64 W. 48th St., New York, N. Y.

10. **Milling Attachment**
Bulletin 130 has been issued by Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass. It presents the Rivett Milling Attachment.

11. **Gear Tooth Checking**
A new bulletin featuring the Fellows Involute Measuring Machine has been prepared by Fellows Gear Shaper Co., Springfield, Vermont.

12. **Rivitor in Aircraft Industry**
The Tomkins-Johnson Co., Jackson, Mich., has issued an attractive folder featuring the T-J Rivitor in the Aircraft Industry.

13. **Special Ball Bearings**
Auburn Ball Bearing Co., Rochester, N. Y., has issued a new folder on specially designed bearings for unusual conditions.

14. **Tube Burring Cutters**
Bulletin 12-T features Severance Tube Burring Cutters and other tools for scores of applications. Severance Tool Manufacturing Co., Saginaw, Michigan.

15. **Rexalloy Tool Bits**
An interesting booklet on Crucible Steel Company's new non-ferrous cutting alloy, now available in tool

bit form. Examples of increased speeds and deeper cuts made possible with Rexalloy are shown. It's booklet TS400. Crucible Steel Company of America, 405 Lexington Ave., New York, N. Y.

16. **High Production Turret Lathes**

Catalog 1073 features Gisholt 1L, 2L, 3L High Production Turret Lathes. Gisholt Machine Co., Madison, Wisconsin.

17. **Multi-Duty Bore-Matic**

The Heald Machine Co., Worcester, Mass., has released a new bulletin which presents the New Heald No. 42 Multi-Duty Bore-Matic for precision boring of big work.

18. **Gear Cutting Tools**

This is the subject of a new 32-page booklet just released by Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Michigan.

19. **Small Tools**

High speed and carbon drills, taps, reamers, milling cutters, hollow mills, end mills, drill rod, die sets, etc., are featured in the new 1939 108-page catalog issued by Victor Machinery Exchange, 251 Center St., New York, N. Y.

20. **Fay Automatic Lathe**

The 24-Inch Fay Automatic Lathe is detailed in a new bulletin published by Jones & Lamson Machine Co., Springfield, Vermont.

21. **Tool Steel Wall Chart**

A new 20 x 30 tool steel wall chart designed to simplify tool steel selection is available from The Carpenter Steel Co., Reading, Pennsylvania.

22. **Needle Point Diamonds**

F. F. Gilmore & Co., 112 Dartmouth St., Boston, Mass., has issued a new folder detailing Gilmore Needle Point Diamonds for truing fine grained or sharp edge grinding wheels.

23. **Drill Chucks**

Folder 100, released by Scully-Jones & Co., 1913 S. Rockwell St., Chicago, Ill., illustrates, describes and lists prices on "Feed as you need" Chucks.

24. **Expansion Reamer**

Staples Tool & Engineering Co., Cincinnati, Ohio, has issued a new folder which illustrates and describes the Staples Carboloy tipped expansion reamer.

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